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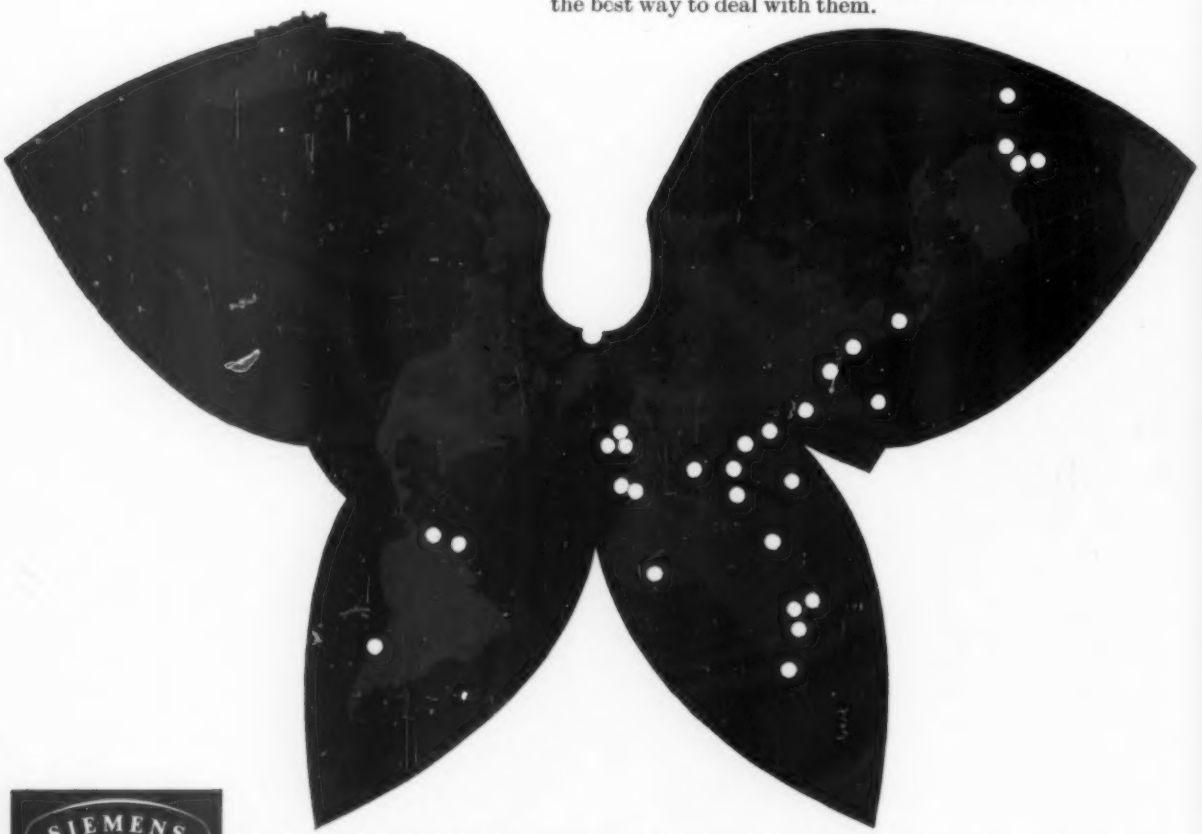

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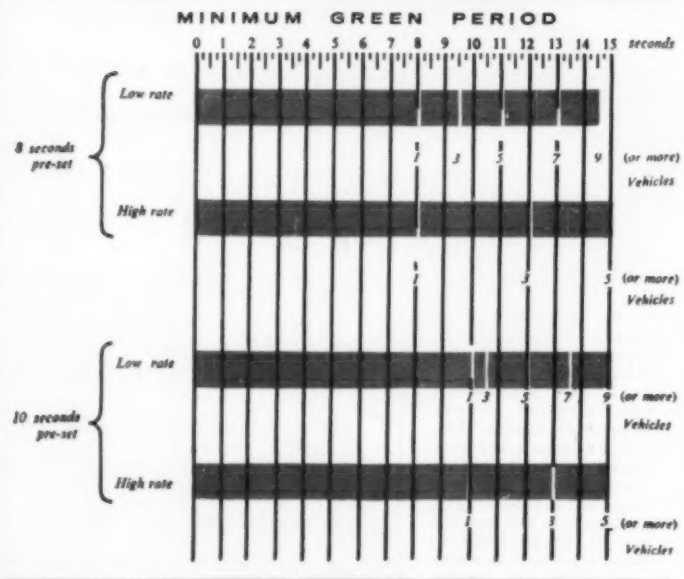
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Low rate
High rate
1 3 5 7 9 (or more) Vehicles
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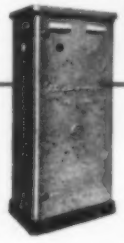

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Need for Forward Planning

EASTER week-end high-lighted the deterioration in road conditions and the appalling toll from accidents, even though the latter was somewhat over-sensationalized since casualties were no greater than last year's average. The demand that something more be done to prevent repetition at Whitsun and August Bank holiday, understandable as it is, comes too late. Resort to palliatives, such as the 50-mile speed limit on roads carrying peak holiday traffic, may act as a slight deterrent to bad driving behaviour but little more. Congested conditions at holiday peaks are in fact to be expected at every fine week-end, and are inevitable for the simple reason that motorization has out-paced the provision of facilities. Congestion is not a disease that can be cured by a shot in the arm but the symptom of failure to cope with twentieth century transport development. In every developed country a rising national income is accompanied by an increase in private transport and it must be provided for. Present conditions therefore are not a malignant growth but a natural one that could have been foreseen and provided for. Those in authority failed to act in time and are responsible for failing to plan in the long-term and to do so scientifically. The motoring public is suffering the consequences of post-war failure to provide adequate capital investment to build a national road system to meet foreseeable needs. Proportionately, transport, apart from its rolling stock, has the worst record for capital investment since the war. One explanation is that roads are not seen to pay immediate dividends. Expenditure comes within the Budget, and above the line, and is therefore the victim of the ebb and flow of national economy, and of the whim of Chancellors of the Exchequer.

The four-year roads programme is running down and has not been extended. Although expenditure continues at £70 million a year it is quite incompatible with needs. For all Ministerial protestation there are no national, regional or local long-term plans which can effectively be carried out because authorizations are handed out piecemeal. The waste of national potential is consequently appalling. Example after example can be given of savings both in time and expenditure that would have resulted from an assured continuity of programme. When the London-Birmingham Motorway was completed, for instance, the equipment fleet was rendered idle and the construction team and manpower dispersed instead of being employed on the building of the next section. The same is true of many an urban area. Where cities like Bristol, Birmingham and Manchester have comprehensive programmes planned with regard to the years ahead they must proceed in bits and pieces although they could almost certainly be completed in half the time authorized. This is madness at a time when the equipment and materials and manpower are all available as Mr. J. Maurice Laing, the retiring President of the Federation of Civil Engineering Contractors, recently pointed out. With this deterioration it becomes all the more essential and urgent that the maximum available resources that can be afforded be devoted to a national roads programme directed at establishing the national network of motorways linked with the planned development of road and traffic networks in urban areas.

Within this context conditions emphasize the need for the application of traffic engineering methods so that, first, the roads programme is based on known and predicted requirements determined after the collection and analysis of traffic data and its projection into the future; and second, the maximum gain is obtained from new construction by getting the priorities right; and third, that the utmost capacity is obtained from existing roads. Ministerial lip-service is frequently paid to the work of the traffic engineer, even although he is sometimes regarded overmuch as a purveyor of palliatives. Inadequate stimulus however is offered to ensure the greater application of his techniques and research. Where municipalities are far-sighted enough to establish traffic engineering units within their appropriate departments, optimum benefit cannot be obtained unless the traffic engineer is able to work to a long-term programme with some assurance that authorization will be forthcoming to enable it to be carried out in a reasonable time.

At the same time two further requirements need to be met: increased facilities for training and more funds for research. The new Chair of Highway and Traffic Engineering at Birmingham is completing its first course with only 23 students. Its maximum intake is 50, but adequate funds for this inadequate number are not available, and numbers are pitifully small at the other universities where courses are available. Only 16 students took the new diploma in Traffic Engineering initiated by the Institution of Highway Engineers this year. The Minister of Transport could usefully inquire into the reasons for the shortage of traffic engineers, and give greater encouragement to their employment. Even so, the traffic engineer is no miracle man and it does not lie within his power to convert a vastly inadequate roads system into an adequate one. Only the Minister can do that, and as yet of his early promise there is no sign of even late fulfilment.

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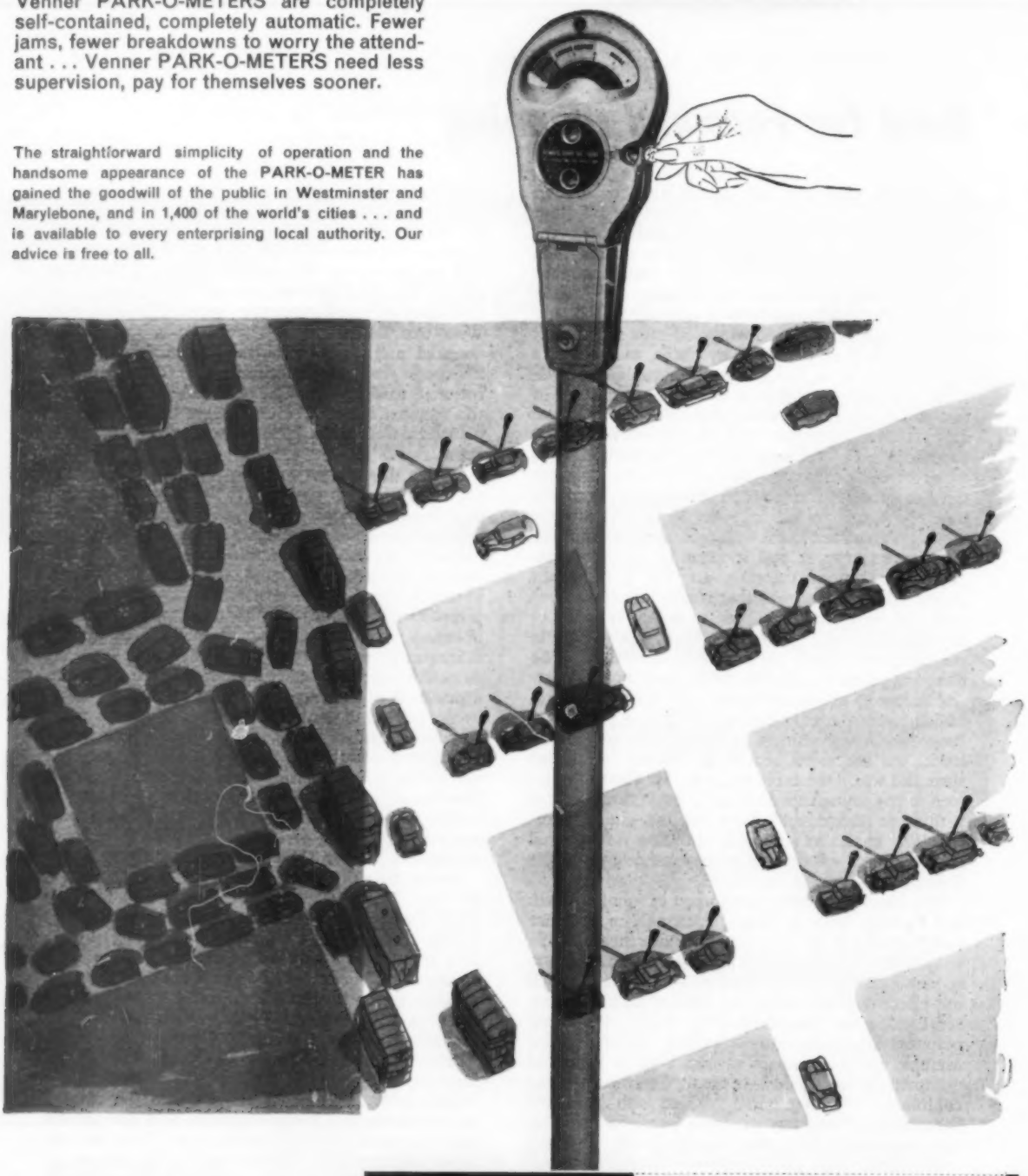

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Topics of the Month . . .

50 Miles an Hour

THE Minister's decision to impose a 50 mile per hour speed limit on certain stretches of road carrying peak traffic at Whitsun is almost a policy of despair, but not quite. It may succeed as a deterrent to motorists taking unnecessary risks, to which they are driven by impatience at delays which themselves are often the result of poor roads. If any casualties are avoided the experiment will be worth while, but it is no answer to the problem of road accidents. There is no evidence that speed in itself is a major cause of road accidents; in fact, the majority take place in urban areas where the limit is 30 miles an hour. Speed is only the cause when it is inappropriate to the prevailing road conditions, or for that matter to the skill of the driver. The experiment can therefore prove little, especially as it is to be applied to good and bad roads alike, some of modern dual carriageway. A far more scientific approach to speed limits than a blanket imposition is required. To this the way is pointed by Burton Marsh in his article on speed laws in the United States where prolonged and detailed study is made along traffic engineering lines on actual speeds travelled, and on road design and conditions, before limits are determined. By and large, restrictions will only be observed when they are accepted as reasonable, and before they are imposed observations of normal speeds are necessary to find out what appears reasonable to the road user. Here unfortunately decision to restrict or de-restrict is more often than not the result of local pressures based not on fact but assumption, sometimes made following accidents to which speed has not been even a contributory factor. While therefore the Whitsun experiment might provide an interesting comparison with conditions on the same roads at Easter, nothing conclusive can be derived therefrom. More valuable would it be if between now and August Bank Holiday careful check were kept on speeds along the same roads and any further restrictions imposed were based on them, bearing the American experience in mind.

Ministerial View of Priorities

WHEN a year ago the Select Committee on Estimates reported that they considered the trunk road programme had been inadequately prepared, that it was to some extent out of proportion and not ideally organized, the then Minister of Transport attacked the Committee for its incompetence. For this he was censured by M.P.s. In the formal official reply Mr. Marples now admits that some schemes were authorized in advance of strict priority but that there are enough schemes in preparation to conform to the priorities set, and to keep the trunk road programme going at an accelerated rate. He points out that priorities are now based on the 1954 census, reinforced by subsequent studies but which, he adds, could not have been initiated until there was a substantial future road programme to which their fruits could be applied. This is the wrong approach. Since the war, the attitude has generally been that the roads system can only be expanded and improved piecemeal, and only to the extent that the Treasury can be persuaded to provide the funds. There has never been a truly national roads policy or programme because there has been no comprehensive assessment of needs. Traffic studies should come before not after expenditure has been authorized, in order that it is known what is required to meet future traffic demands. The programme can then be phased according to the availability of national resources.

The Committee also considered that higher priority should be given to schemes for improving urban traffic conditions. In reply, the Minister states that priority was given to improvement of the main cross-country network because it would bring quicker and greater economic return for money spent. Such improvements, including the provision of by-passes, he claims, contribute considerably to the relief of urban congestion. Here again the Minister is misled. All serious traffic studies show that the larger proportion of vehicles using rural roads are headed for nearby towns, their final destination is an urban area. Consequently, the relief provided by a by-pass is often less than presumed. Urban roads programmes must therefore travel along with all other road improvement if the full benefit from new construction and improvement is to be obtained. The one cannot be separated from the other any more than improvements can be made inside the cities without regard to general development.

Who Is Bluffing Whom?

THE Minister of Transport sometimes makes the most extraordinary statements. Having launched the Pink Zone at Christmas with terrific aplomb, he now tells us that it was all a bluff. True, the Pink Zone was not a hundred per cent success, but it brought some relief, so where was the bluff and who was bluffing whom ? The basis of the scheme was twofold. Additional car parks were provided in Central London and on the periphery, and the parking regulations, already in force, were more strictly enforced. It was little more than that. To the extent that it succeeded it did so because the motorist was aware that if he did not obey the law he was running the risk of a summons. As long as he believed this, the Pink Zone worked because the motorist was either deterred from bringing his car into Central London, or if he did he had to use off-street parking or obey the regulations. The bluff Mr. Marples presumably had in mind was not concerning the zone's legality but that unless the motorist co-operated enforcement was impossible because the burden on the police would be too great. That is always so, but it does not help the future success of Mr. Marples's plans to speak so lightheartedly and to discourage the motorist from taking him seriously. In the event the Pink Zone was a valuable experiment. It showed, first, that if it is known that parking restrictions will be enforced they are obeyed, second, that if off-street car parks are conveniently located in relation to need they will be used, and third, that the enforcement of the restrictions speeds up traffic flow. This then is the main lesson, and it is applicable equally outside of London: that by applying intelligent planning and combining restriction to remove obstruction with the provision of alternative facilities some temporary relief to congestion can be obtained. At least the bluff worked to that extent.

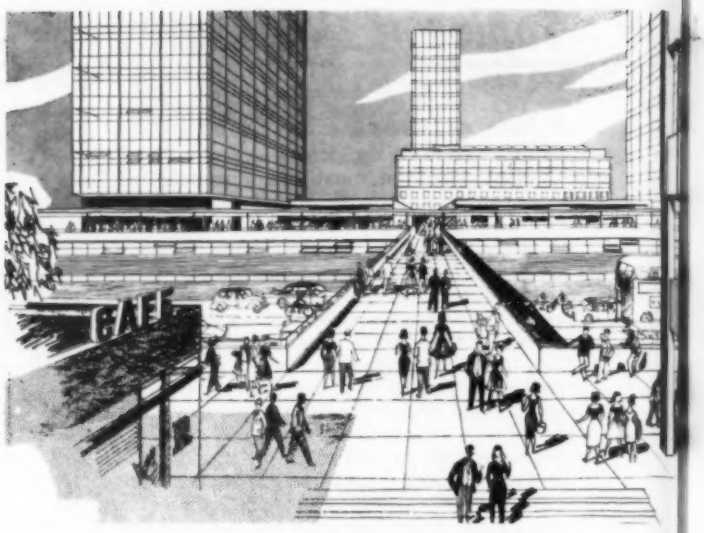
Traffic and LAND USE

by

William Holford

President-Elect of the

British Institute of Architects



I AM going to use the word *traffic* in its old and general sense—the circulation and movement of people and goods and vehicles and information. As for *land use*, it is the primary concern of town and country planning as it has come to be known in Britain, the second being the actual forms of development or conservation which the use of land entails.

Every form of accommodation, whether factory or warehouse, office or shop, place of assembly or family house, has its own internal problem of circulation; and this was so before the automobile was invented. Internal circulation has two more or less permanent characteristics: it is intimately related to the human scale and to the dimensions of human beings, even when mechanically operated as in lifts and escalators; secondly, it is on the whole more rectilinear than curvilinear in character, taking its shape from rectangular objects such as tables, rooms and building frames. Helical ramps and the spiral descent of the Guggenheim Museum in New York are exceptions to the general rule. Pedestrians, and the internal circulation that permits them to use buildings and public places, have therefore a prior and permanent claim to the city. Cities in fact have always been created by architecture and not by traffic. As soon as traffic takes precedence over buildings, urban values are diminished.

Circulation in the Countryside

External circulation between cities, or between town and country, or between the differentiated parts of a large urban area, ought to obey quite different rules. It is subject to quite frequent changes of vehicle type, speed and design. It also continuously increases in scale. Road intersections and road widths, power stations and transmission lines, airports and their buildings, can all be keyed to the larger elements of the natural landscape of Britain if skill and imagination are used in their siting; but they are now not so easy to ally to the smaller features of the landscape, especially those which are man-made. For this reason an architectural eye, preferably that of the trained landscape architect, should be cast on the plans and sections of new motorways even when they are drawn up by competent civil and traffic engineers, who are ultimately responsible for the appearance as well as the efficiency of the road.

The more urban the motorway becomes, the more important it is that this architectural eye should make adjustments between road, landscape and townscape. But the main function of all external circulation is traffic, and traffic engineering should have priority over existing uses and indeed over the preservation of all existing property except that which has outstanding historic or scientific value. Experience in land acquisition for M1 has shown that it is still possible to pick a route across the countryside, even in these overcrowded islands, without fabulous cost and without doing damage to sites and buildings of special interest. With the mass production of motor cars, a revolution has taken place since the start of this century; and Britain has to adjust herself to it as to the main industrial revolution that preceded it.

In the country the proportion of total land area used for external circulation may be less than one per cent; and traffic and landscape engineering can use relatively undeveloped land to create an asset of enormous economic importance to the country as a whole—as indeed the railways did a hundred years ago. This fact is not palatable to the countryman, who derives less local benefit from the new roads than he did from the old ones, nor to those concerned with the preservation of particular parts of the countryside, even though they recognize some long-term advantages in keeping motors more and more to motorways and less and less to the narrow, winding and usually beautiful all-purpose roads. Some local amenities are bound to suffer; but it seems right that a national asset should be created at national cost; and for land acquisition and compensation that cost is relatively not very great.

Circulation in the City

In the main building zones of a city, however, the percentage of land given over to existing circulation is much higher, and new land for additional elements

of circulation is extremely costly. It is not easy to plan even a housing estate with less than 15 per cent of the total land area given over to vehicle and pedestrian circulation in one form or another, and it may go as high as 25 per cent. In central areas the proportion is usually nearer 35 per cent; and this excludes railway land. On the other hand, the main urban assets have already been created by building; and traffic engineering has somehow to maintain them without destroying the purposes of the city in the process.

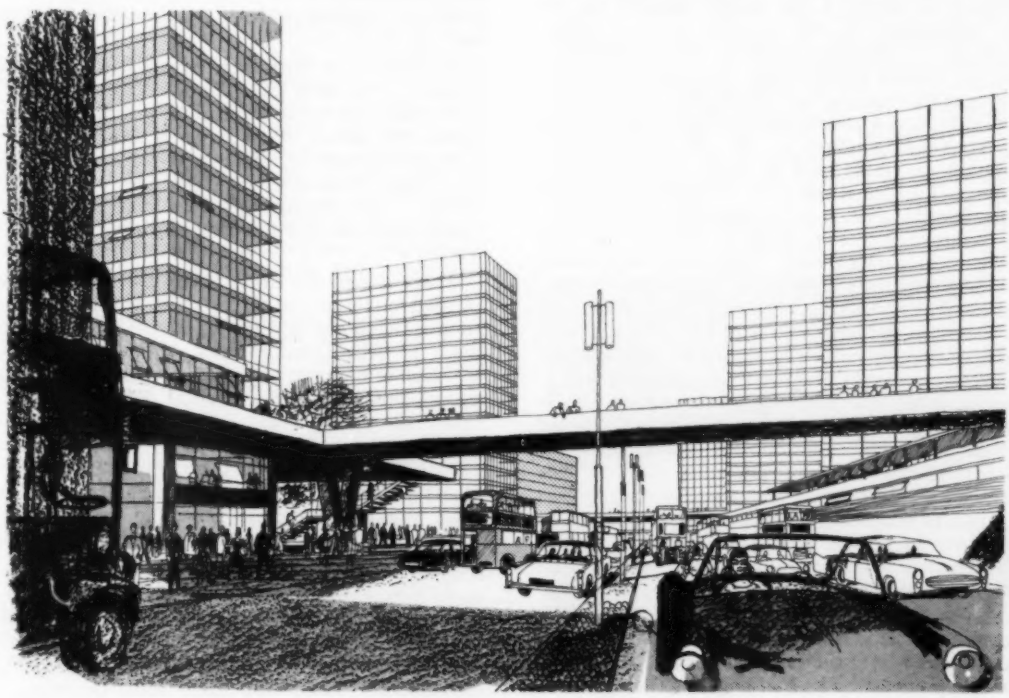
The owner-driver of a car in London who finds that it now takes him half-an-hour to get from one side of the central area to another, may not agree; nevertheless the main function of a city is not traffic flow but accommodation. Circulation, although obviously essential to all a city's purposes, is secondary to the manufacture, administration, display, storage and exchange of goods and services, and to the housing and recreation of those employed in these activities. Transport's task is to keep these activities going without seizing up through congestion, and in the knowledge that more than a third of the superficial land area is already given over to circulation. It is hardly surprising that additional road capacity should be not only intrinsically costly in terms of land and construction, but that the extra economic advantages it would bring to the city (beyond the real but still negative one of reducing congestion) should not be as great as for a cross-country motorway. Moreover, some of the costs—and benefits—of the urban road system are national, but for the most part they are local, and competitively so.

New construction is therefore only one aspect of the urban traffic problem, although an important one. Within the general framework of the town plan it has still to prove itself economically and to demonstrate that it will not create more problems than it solves. So it ought to be *part* of the Development Plan and not a law unto itself. While it is being proved and processed, and in association with it then and thereafter, both planning controls and traffic controls must operate to keep the system working at all. What can planning control achieve?

Size and Volume Limitations

Most building and planning controls, apart from those in the interests of public health and safety, derive from the need to reduce concentration and congestion. Population increase is itself a world problem. Coupled with industrial development and a rising standard of living, it brings increased competition, the need for more living and working space per person, a great multiplication of piped and cabled services, and above all of vehicles. As land itself is limited, there are far greater demands on its use than there were a hundred years ago when the population of England and Wales was little more than a third of what it is now, and in towns there is a demand for mixed uses on the same piece of land. The two most important planning controls are therefore those over the nature of the uses to which land may be put, and over the amount or volume of accommodation that can be constructed over a unit area such as an acre.

The Use Classes Order under the Town and Country Planning Acts, defines in great detail, among other things, what changes of use are permissible. But the curious fact is that whereas accommodation is highly differentiated for purposes of control, circulation is not. Without permission you may not convert your garage into a fried fish shop; but the street in front of it can take your van as it comes from Billingsgate, or a ten-ton lorry on its way to M1, or a flock of motor-scooters and push-bikes, or a brewer's horse-



drawn dray, or a caravan on tour, or even the parked car of a complete stranger who does not happen to have a garage of his own. Because of sheer congestion it now seems as if the freedom of the Queen's Highway is bound to be progressively restricted.

The planning control of size, bulk, volume, or density is of equal importance for traffic. Planners have always recognized the difficulty of planning for a community which is likely to expand irregularly and indefinitely. Garden cities and the post-war New Towns are all planned for a limited population and within a permanent green belt. Some of the old historic towns also, like Cambridge, have considered whether they would double their advantages if they grew to twice their size, and have concluded that uncontrolled spread would lose them many of the advantages they now have. This does not mean that all growth would be restricted or redevelopment discouraged, but that as a matter of considered policy large-scale or mass-production industry would not be permitted, and the surrounding farms would in general be restricted against development as housing estates. With some such policy in force the traffic problems of the town can then be approached scientifically, and on the basis of realistic traffic statistics. New construction would, of course, be no cheaper than anywhere else; but its benefits could be more accurately calculated, and a reasonable balance maintained between the size of the town centre and the whole urban area, between pedestrian and vehicular space, between through and local traffic, and between the different categories of streets and parking places.

In the big town where congestion is already serious, the control of commercial or industrial building volume, of residential density, and of the relation between the two, is clearly of prime importance. It should, in fact, go hand in hand with every traffic improvement survey. Little formal research has yet been undertaken in this country on the traffic-generating characteristics of different kinds of development, at various heights and densities, and incorporating more than one level of circulation and access. There is by now a considerable amount of experience in local planning offices on the effect of building restriction on traffic, and of traffic restrictions on buildings. Further it must be remembered that all urban development requires planning permission. The rather negative restrictions of plot ratio or coverage, car parking ratio, daylighting angles, and sheer height on the one hand, and of one-way streets, right-hand turns, set-back lines, corner splays and rear access on the other, are now being incorporated by the more progressive authorities in more comprehensive and positive proposals for the developer to consider, often illustrated by block models. These proposals may relate in a new way height and bulk and set-back from the street, or indicate methods by which residential and non-residential uses could be combined within a given plot ratio, or suggest that the whole of the ground floor and basement might be given over to vehicle access, loading and parking, while the shop windows and pedestrian walkways are raised to the first or main floor level (as illustrated).

It is obvious that in heavily built-up areas planning controls and traffic controls are indivisible. It is also obvious that as it is the essential purpose and nature of a city to attract by its buildings, its shops, and its public places, by its exhibitions, theatres, halls, museums and galleries, and by the animation of its crowds and its social occasions, the appearance of its streets and buildings has to be considered *at the same time* as their functions. There is absolutely nothing to be said for aesthetic control for its own sake, which sometimes merely substitutes the prejudices of the back-room boys, aired without any final responsibility for the execution or cost of the work, for the design of an architect or engineer who has interpreted in an original and economical way the instructions of his client. There is, however, much to be said for planning control—or at least influence—over the forms of architectural and engineering structures in the same urban group in the interests of civic design—which includes public circulation and access as well as public amenity.

Planning and Engineering, Joint Methods

The technical means by which land-use planning and traffic engineering can act jointly to improve the deteriorating conditions of life and work—and also of the journey to work—in cities, will be the subject of subsequent studies to be published in this journal. Many of them have been tried out in other countries, some are being tried here. London, by building the Metropolitan Railway a hundred years ago, opened up for the first time in a great metropolis a new level of subway circulation which many people said was so alien to human nature that it would never be used. In fact it was very successfully used, and was followed by the multi-level system at Farringdon Street and later by the deep-level tubes. With public underground and surface transport again at saturation point the exploitation of upper levels for the pedestrian seems inevitable; but it cannot be carried out in a comprehensive way, even in the few areas in which it is practicable at the moment, without the closest collaboration of the planning and the traffic authorities and the police.

In addition to separation by level, separation by zoning at the same level has a lot to commend it. The pedestrian street and market is almost as old as urban civilization. What is new is the possibility of adapting an existing traffic street to this purpose by providing alternative carriageways and parking around it, and paying for them out of the improved values balanced over the comprehensive scheme as a whole.

There is also the study of the best forms of car-parking buildings (or of car-parks within buildings, such as hotels and department stores) to suit different kinds of urban road systems. There is the related question of time zoning for service vehicles in certain downtown areas; of the levelling out of holiday and rush-hour traffic peaks; of the use of the most efficient carriers for specific types of traffic. Finally there is the problem of the main town road or freeway, of which the Cromwell Road-Hammersmith-Chiswick sections of the new road going west out of London form an early example, and the projected Glasgow central area 'ringway' another.

Traffic, it has so often been said, is a means of communication, not an end in itself. Research and experiment undertaken jointly by traffic engineers and town planners is the best possible illustration of bringing ends and means together.

MOBILITY AND ENVIRONMENT

by JACK H. NAPPER

Professor in Architecture, King's College, Newcastle-upon-Tyne in the University of Durham

Writing with the experience of a practising architect and town planner the author warns of the threat of the motor car to the preservation of our towns and cities as centres of community life. He argues the need to create a new urban environment and suggests some new means to that end.

URBAN civilizations are now at a stage comparable with the change from nomad tents to the fixed building and the permanent settlement. This change in environment and living habits was caused by the growing of crops instead of hunting game—a change from mobility in a natural environment to a static man-made one. Today the change in living consists in personal mobility (mechanical inventions) and the mobility of whole families (economic). It will be expressed in changes in environment, the exact forms of which are only just beginning to emerge.

The first urgent problem today is to attempt to arrive at reasonably clear ideas of the kinds of environment we wish to have, taking into account the mobility caused by the motor car within the town. Before we can imagine what kind of architecture will emerge some conception of the town building programme is necessary. For instance, will high density development occur at the centre, to house commerce, shopping and housing, or will high density commerce and transport be sited peripherally? Really scientific and imaginative planning ideas could revolutionize our ideas of architecture. The rest of the article discusses this problem without making any attempt to appraise the second urgent problem, which is to examine whether new conceptions of the town can be translated into buildings and environment within present laws and regulations.

Former Urban Characteristics

Our old towns and cities nearly all had the same characteristics until about 1914. With some over-simplification they may be summarized.

1. *Complex town patterns* had evolved by relatively slow processes of economic and social change. These produced tensions which dictated the forms of segregation (commerce, transport, industry, housing) and the accidents of development which give towns their character. They were rarely planned at all. Occasionally a formal plan—a grid—might be used as at Fleetwood and Middlesbrough, entirely unrelated to functions.
2. *Road patterns* forming the web of main communication were of some antiquity depending on subsoil and oddities of land ownership if they deviated from the direct line between settlements. They were not planned. Deviations and time were not of much importance.
3. *Railways* had brought stations as near the town centre as possible. The routes and the marshalling yards were sited without much regard to their effect on neighbouring property. They were certainly not sited as part of a planned expansion of the town.
4. *Access to nearly all buildings* within the real town was by way of the paved street and it was found convenient for most buildings to crowd tightly right up to the edge of the pavements.

When towns with these characteristics coalesce into conurbations, with the help of industry and housing released from the ties of canal and railway, whole regions descend to levels of visual and social squalor. Some century-old slums created by the smoke-carrying mobility of the steam engine were confined within the linear soot fall-out area of the railway. New social slums created by the car, so far, have been located outside the real town and the agricultural and residential landscapes of the eighteenth and nineteenth centuries have been engulfed without being replaced by a satisfactory living environment.

Unless we have ideas on what towns should do and

Fig. 1. The Lijnbaan, Rotterdam, where pedestrian precincts are planned together with high flats and offices.

what they will provide as environments for living and working, it is impossible to move towards any objective—planning is not possible. For example, superimposing a grid of fast motorways onto an existing town pattern is not working to a human objective, it merely appears to solve one mechanical problem. Even if it solves the arrival and departure of cars it leaves other problems unsolved and brings the probability of new slums within areas of high, or high potential, land values. This need not be so, but decisions are being made now which we may regret within our own lifetimes, not, as in the case of the railways, two generations later. 'Underneath the Arches' is not usually associated with high land value or high rents in town centres.

To examine, however briefly, theories of town development is too big a task in a short article, but some general agreement on what is meant by environment is needed if we are to appreciate the urgent need for drastic political and executive action. To integrate the idea of the town with the mobility of the car looms large now—it is only one of many new problems.

Any theory to do with towns must be based on and constantly referred back to people. This sounds obvious and trite, but it cannot be said too often to technical formalists obsessed by the beauty of what they conceive to be perfect solutions to parts of the whole problem—planners, engineers and architects are all prone to this engaging weakness.

If a cross-section of people were asked what sort of place they would choose in which to live and work, even though they have never lived in a market town or village, that is the environment most of them think would provide the opportunities for a full life. Sociologists tell us that small towns or large villages—even the smaller industrial town of up to 30,000 people—exhibit a social cohesion or neighbourliness, not possessed by the larger modern town. This generalization must be modified as some cities, like London, are collections of small towns joined together, retaining the qualities of neighbourhood within themselves. In the Abercrombie Report and Plan for the L.C.C. this quality became the theoretical basis for planning. If social cohesion is important; if, indeed, towns are still important in the old sense, then the last sixty years have seen developments in things (cars), ideas (garden cities) and family-work relationships (mobility) which have destroyed the old type of urban environment. Car automation in the last eight years, allied to a rising standard of living, is completing the destruction.

Need to Create New Urban Environment

Can social cohesion be developed within an entirely new physical environment, for example, in really well conceived high buildings? This question must be asked because we have become obsessed by the pseudo-picturesque idea of the village as an environment. When applied without adequate controls on the scale of building possible today, this idea has appalling results, whether to a new town or to unending suburbs on land becoming increasingly scarce. Because such spreading is made possible by the car Frank Lloyd Wright once suggested it as the solution appropriate to the new age. Its most destructive effect, when combined with expansion pressure within the centres of towns, has been to eliminate the civilized practice of living in towns. The Barbican Scheme for the City of London goes some way in attempting to restore this essential element of a true city. Towns are not alive unless subjected to continuing tensions. These create its character. Diversity, within limits, can help to create and resolve tensions. People living in cities know and use them; even have affection for them. People only working in cities escape from them for leisure and rarely have affection for them.

Segregation

Whilst it is the motor car which is forcing us to reconsider the town, as an idea and an environment, the development of tele-communication has removed the original need for people to crowd together in a market place and, therefore, for buildings associated with commerce to be located at a transport centre—the heart of the town. Commerce, like the house, is now foot-loose, or wheel-loose. The 'Drive-in-Bank' is only one manifestation—an odd one. Buildings for commerce could in fact be sited in peripheral parks, green or asphalt, to taste. The buildings could be of first-class quality and the high cost of land would not be present. Quiet, clean, healthy, working conditions and easy transport on new outer ring roads would be the magnets. It may well be objected that this is merely repeating, with city buildings, the spread which already we deplore in suburban housing. It would be taking away the possibility of people meeting to get to know each other and by exchange of ideas make the town a living human thing. It is the heart of our problem of environment. At this stage of the argument one is tempted to suggest that buildings in large towns must go up very high indeed in selected zones. Also, to avoid the absurd concentration problems of New York and to provide contrasts, there must be quite drastic contrasts in scale. Pedestrian activities would take place in volumes defined and articulated in such a way that normal humans would enjoy their surroundings in comfort. The high buildings would be spaced in the town plan so that their human and vehicular traffic problems can be handled and other buildings, associated with pedestrian decks, will have different scales and furnishings. (See Figs. 1 and 2.) The extension of the St. Paul's precinct into the Barbican area with the more complex activities of people living their seven ages, will provide one of the most important experiments of our time. (See Fig. 3.) Environment for people, which these schemes illustrate, is only possible by the segregation of wheeled traffic; segregation which is only economically possible in very large cities where high land values justify the capital expenditure in central areas. Mixed heights of building and horizontal pedestrian decks are also essential. People do not meet for discourse in lifts. Also very high buildings are inflexible as they can rarely be altered horizontally or vertically, only internally.

The logic of complete vertical separation appears sound in that any sinking or raising of traffic will interfere drastically with services and land values, not to mention the destruction of environment. One of the exciting aspects of the raised pedestrian deck is that the tyranny of the access street has disappeared and one will be able to do things only possible previously in places like Venice and Vicenza. By this is meant that one may look down and look up with

Fig. 2. Pedestrian precinct, the Lijnbaan, Rotterdam.

pleasure; one may stand and talk in a space without danger or discomfort.

There still remains the question of the buildings in medium-size towns and of the areas in large cities which are outside the central zone. In such areas of mixed activities the capital value still existing in buildings and services, coupled often with large areas of derelict or little-used land, presents the most difficult of all problems. Because town functions are so diverse it is almost impossible to predict what will happen. If one could assume the head lease of the land being held by the planning authority it might be possible to begin a programme for re-development which would have as its object the creation of true town environments.

'The Living Suburb'

One suggestion by Chamberlin, Powell and Bon, Graeme Shankland and others, called 'The Living Suburb', accepts the theoretical separation of work and certain other specialized functions from the rest of people's activities. The resulting type of town deals with housing, leisure, recreation and most shopping. Transport, both public and private, is dealt with comprehensively and unobstrusively whilst the shopping-entertainment piazza and the varied types of housing related to green spaces appear to re-create the atmosphere of a true traditional town in a different scale, similar to the same designers' scale for the Barbican scheme.

For the provincial town, a very mixed problem, re-development is no less urgent but, apart from its centre, will take place at a slower pace than in cities. To see the high blocks of flats going up on the outskirts of northern Italian towns like Brescia and Vicenza, on land just outside the old city walls, makes one wonder whether this may not be our answer too. The Italians have not yet encircled their historic cities with industry and bungalows. We have in most towns a ring or sector of Victorian villas in large grounds which would often be ideal places to start re-development. People could live once again within walking distance of the town centre. It seems unlikely that these towns will embark on expensive overhead or sunken motorways within the town. This means that well-known administrative methods of dealing with parking, coupled with some vigorous building for cars near the centre, will probably leave the main problem as the efficient re-siting of traffic routes and new building. The latter still needs to be serviced by wheeled traffic but the questions to be answered concern the forms of buildings to be developed so that they do other things besides functioning efficiently within their own programme. These would be to (*a*) form a satisfactory background for pedestrian activities, and (*b*) allow efficient servicing by wheeled traffic, assuming that the old idea of the street building line is abandoned.

If we accept that main traffic routes in these towns will still be at ground level, certain possibilities suggest themselves. By restricting access to the town centre proper to servicing and public transport vehicles and to setting down visitors to buildings, it would be possible to group buildings into large enough block developments to form piazzas, terraces, small parks, etc. within them or alongside. In this country no examples of such development have been attempted because street parking is tolerated in town centres and nearly all building plots are individually developed.

In all schemes which have as their object the creation of environment in an age of mobility a vital element is 'change'. The more we get to know about towns the clearer it becomes that facts become obsolete as soon as they are known. Such facts only have relevance when they are part of a continuous process of knowledge which serves to show trends. Mobility of ideas affects the physical mobility of people and ideas circulate now infinitely faster than they did before radio broadcasting. Understanding of facts is also part of the problem. 'A' level intelligence in the son has destroyed the father figure, who left school at fourteen. Understanding is best realized by human contacts and towns could re-establish these contacts, now in danger of being severed by mechanical and electronic marvels.

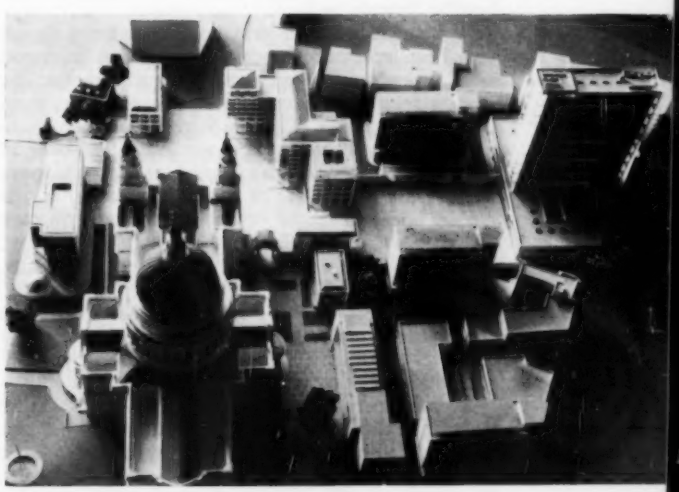


Fig. 3. Holford's scheme for St. Paul's. An example of planning near a great city monument which would also provide an environment where city dwellers and workers could shop, meet, talk, do business and move about in safety.

AMERICAN REPORT

Engineers' Approach to SPEED LIMITS

by BURTON W. MARSH and WILLIAM L. CARSON, Traffic Engineering & Safety Department, American Automobile Association

THE authors have noted with interest the deliberations on vehicle speed control that have been taking place in various European countries. The adoption of speed control legislation and the establishment of speed limits also continue to receive much attention in the United States. Proper and reasonable speed control should be a matter of concern to traffic engineers not only because it affects the efficiency and safety of vehicle movements, but also because the traffic engineer is the person to whom authority and responsibility for the institution of such measures are desirably delegated. It is believed that the following discussion regarding speed control practices in the United States will be of interest and value, especially in view of the Whitsun 50 mile-an-hour limit.

Traffic Speeds in U.S.A.

Improvement in motor vehicles and highway design have been reflected through the years in increased vehicle speeds on United States roads and streets. The average speed of motor vehicles travelling on main rural roads in the United States has risen from approximately 20 miles per hour in 1910 to over 50 miles per hour today. Data from more than 900 speed studies conducted in 29 states showed that the average speed of motor vehicles of all types on such highways was 51.9 miles per hour in 1959, a record high. (The average speeds for passenger cars, trucks, and buses were 53.2 m.p.h., 47.2 m.p.h. and 53.5 m.p.h., respectively.) These data are based on observations made when drivers were generally able to travel at desired speeds, unhampered by traffic congestion or other hindrances.

Average speeds in urban areas are, of course, much lower than those in rural sections—about 50 per cent less. As is to be expected, average speeds of vehicles travelling on highways in eastern areas of the United States, where traffic and topographic conditions tend to restrict speed, are lower than those in other sections of the country by about 6 miles per hour. As higher speeds are made possible through better highways, and as motor vehicle usage increases, the importance of giving concerted attention to vehicle speed control becomes greater.

Speed and Safety

In the United States, there has been a tendency among certain non-professional groups to overestimate the extent to which speed contributes to traffic accidents. Much too often, this viewpoint has been accompanied by a general 'crack down' on motor vehicle speeds without proper determination as to whether or not high speeds, as such, were actually a major contributory factor in accidents occurring in the jurisdiction involved. Unquestionably, speed in excess of that which is proper under existing conditions is a serious hazard to safe vehicle movements and should be brought under control. However, it does not follow that attempts should be made to lower general vehicle speeds as a panacea to a traffic safety problem. An unsafe speed can actually be a very low one in terms of miles per hour, while comparatively high vehicle speeds can be safe under certain road, traffic, weather and other conditions.

A comprehensive report[1] on traffic safety published last year by the Federal government presents some very significant and enlightening data regarding the relation of speed to safety in the United States. It includes the results of a study of accidents that occurred on some 600 miles of modern rural highways over a 3 to 4 year period. As shown in Fig. 1 opposite, this study found that vehicles travelling between 55 and 70 miles per hour had the *lowest* accident involvement rate, and vehicles travelling below 40 miles per hour had the *highest* accident rate. While noting certain minor qualifications with regard to interpretation of the study data, the report states that

> The differences in the involvement rate at the various speeds are substantial enough to suggest that relatively high-speed driving is, on the average, safer than either low-speed or excessively high-speed driving on main rural highways where good design and other features are adequate to accommodate it.

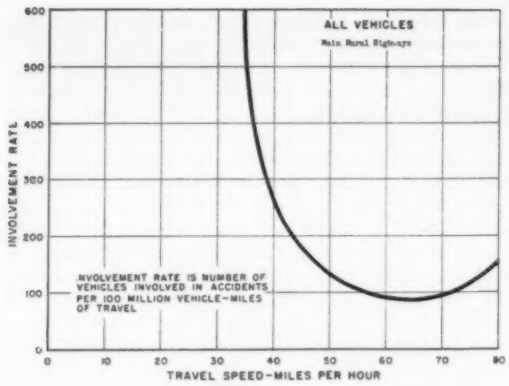

ALL VEHICLES
Main Rural Highways
INVOLVEMENT RATE
INVOLVEMENT RATE IS NUMBER OF VEHICLES INVOLVED IN ACCIDENTS PER 100 MILLION VEHICLE-MILES OF TRAVEL
TRAVEL SPEED-MILES PER HOUR

Fig. 1.

The report adds that

> The finding that moderately high speeds are associated with the lowest accident rates on highways, properly engineered for accommodation of high speed, is of much significance and should lead to more realistic speed control practices based on engineering studies.

Accidents involving vehicles travelling at high rates of speed are likely to be serious ones. The Federal Government's report, the data for which were compiled and analysed by the U.S. Bureau of Public Roads, also presented significant information in this regard (Fig. 2). For the accidents covered in the study, there were 31 persons injured for every 100 accident-involved vehicles travelling at 40 miles per hour; while there were 86 persons injured for every 100 accident-involved vehicles travelling at 70 miles per hour.

The above statistics apply to main rural roads. However, accident studies also indicate that high speed, as such, is not a major cause of traffic accidents in urban areas. An analysis of fatal accidents occurring in the urban areas of some 14 states during 1958 shows that 58 per cent of the motor vehicles involved were travelling at 30 miles per hour or less, 77 per cent at 40 miles per hour or less, and 87 per cent at 50 miles per hour or less[2]. Unfortunately, the available data do not permit relating these percentages to the proportions of all vehicles, whether or not involved in accidents, travelling within the specified speeds.

Thus, research and analysis of U.S. traffic accident data strongly imply that speed excessive for existing conditions, rather than high speed itself, is the most important factor to be considered in controlling vehicle speeds for improved traffic safety.

Types of Speed Laws

In the United States, regulations governing motor vehicle speeds on public roads are set forth in state and local laws—there are no national speed laws. Unfortunately, there is considerable variance as to the types of speed laws enacted by various jurisdictions, and this often proves troublesome to motorists travelling from one area to another. As is true in other aspects of traffic control, it is highly desirable that there be uniformity in the fundamentals followed in speed regulation. The meaning of speed limits, the principles and practices followed in their application, and the requirements placed upon drivers who must observe them, should be consistent among various jurisdictions. This should not prevent adapting specific speed limits to conditions existing at the locations involved.

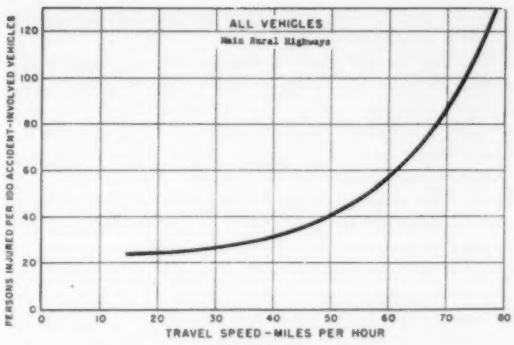


Fig. 2.

Basic Speed Law. Each state in the U.S.A. has adopted legislation covering what is commonly known as the 'basic speed rule'. The substance of this law is that motorists shall drive their vehicles at speeds that are reasonable and prudent in light of conditions, with due regard to actual or potential hazards. In four states, this is the only speed law generally governing daytime passenger car travel on rural roads.

Prima Facie Limits. In seventeen states, the basic speed rule is supplemented by state-wide *prima facie* speed limits. Simply stated, speed limits of this type mean that any speed higher than the posted numerical limit is *prima facie* evidence that the driver is not travelling at a reasonable and prudent speed. If a motorist drives faster than the *prima facie* speed limit and is arrested, he has an opportunity in court to prove that the speed at which he was driving was actually reasonable and prudent under conditions existing at the time. On the other hand, if a motorist is arrested for driving at a speed below the posted limit, it is the responsibility of the arresting officer to prove to the court that the driver's speed was nonetheless not reasonable and prudent under the conditions. Thus, this type of speed limit recognizes the fact that no one given rate of travel is necessarily safe or unsafe under all conditions and circumstances. The pros and cons of this particular type of speed limit are too complicated for discussion in this article. However, it should be noted that considerable opposition to this type of speed limit exists among certain interests in the United States. One reason cited is that it is more difficult to enforce; another is that drivers need to be given one top speed limit which they know applies at all times. Both authors of this report strongly favour *prima facie* speed limits.

Absolute (Fixed) Speed Limits. Some 27 states have absolute or fixed speed limits that supplement their basic speed law. Limits of this type are illegal to exceed at any time and under any conditions. No determination is left to the police on duty or the court as to whether or not the driver was proceeding at a safe speed at the time that he exceeded the speed limit. Advocates of this type of speed limit cite mainly its definiteness of meaning and the comparative ease with which speeding convictions can be secured.

Special Speed Limits. Thirty-one states set lower daytime speed limits for trucks than for passenger cars, while some 19 states have reduced limits for night-time travel. Various special speed limits have also been adopted by different states to cover certain

vehicles and conditions—such as cars towing house trailers, school areas, etc.

During recent years, a number of state and local authorities in the United States have established minimum speed limits as a means of alleviating the adverse effects which slowly moving vehicles have on heavy traffic movement and on safety. Most minimum speed limits established to date are 35 to 40 miles per hour. The establishment of minimum speed limits is now authorized in about half of the states, and the results of their use have been generally favourable. It is expected that more extensive usage will be made of minimum speed limits in the future in an endeavour to realize the full operational and safety potential of streets and highways, particularly those of high-design standards.

Speed Zoning

Although almost all states have state-wide maximum speed limits, increasing use is being made of speed zoning in order to adjust speed limits (either absolute or *prima facie*) to the particular conditions that exist on individual sections of highway. Speed zoning may be described as the establishment of reasonable speed limits, on the basis of traffic engineering studies, at locations where the general state-wide speed limits are too high or too low for prevailing conditions. Locations in which speed zoning is most often needed include:

1. roads or sections of roads that have design standards higher or lower than those of most highways in the state or community involved,
2. suburban and other transitional areas between sparsely developed and highly-built-up areas, and
3. sections of streets and highways on which unusual conditions exist or where it is otherwise inadvisable to apply the limits set forth in general state laws.

Speed zoning utilizes traffic engineering principles in the determination and establishment of reasonable speed limits. It is increasingly being employed throughout the United States as the need for more scientific control of motor vehicle speeds is recognized and as its value becomes more evident. In addition to providing drivers with sensible speed limits, speed zoning produces more uniformity in actual vehicle speeds—thereby facilitating safe and efficient movement of traffic. Moreover, speed zoning develops respect for speed limits, the reasonableness of which is usually easily discernible by motorists.

The criterion most used in determining the specific numerical limit to be established is the 85 percentile speed—the speed at or below which 85 per cent of the vehicles travel. Before-and-after studies have substantiated the propriety and value of this criterion, and it is now followed by most traffic engineers in their speed zoning programmes. As a general rule, the speed limit established should never be more than 7 miles per hour below the 85 percentile speed except under very unusual conditions. For purposes of evaluation, re-checks of the 85 percentile speed and other elements which may have influenced determination of the limit should be made after the limit has been in effect for several months. In determining the 85 percentile speed, it is desirable to record the speeds of from 250 to 400 vehicles.

Driving speeds will be affected by the type of area being traversed, highway design features, pedestrian movements, parking, traffic volume, nature of traffic (commercial or private, through or local, etc.), sight distances, pavement surface conditions, apparent hazards and hindrances, and other conditions by which driver judgments are made as to a proper and safe speed. Although the 85 percentile speed will reflect such factors, it is advisable that the speed zoning procedure include an analysis of these elements, individually and collectively, and whether or not they together are sufficiently important and influential to require a speed limit different from that based on the 85 percentile speed. Of particular importance is a review of accidents occurring on the stretch of highway involved and, specifically, of those accidents in which speed apparently was a causative or severity factor. In relatively few instances, however, will much adjustment from the 85 percentile speed be needed.

As a further check on the advisability of a particular zoned speed limit, it is desirable to determine the 'pace' of vehicles. The pace is that range of speed, generally a 10 miles per hour range, in which more vehicles are travelling than for any other similar range of speed. It is important to have as large a proportion of vehicles as possible travelling within a fairly narrow speed range, for this will minimize conflicts within the traffic stream and improve the flow of traffic. Generally, the upper limit of the pace should approximate the 85 percentile speed.

Speed Zoning Results

The extensive speed zoning programmes conducted by various U.S. states and cities have provided some very significant information as to the effects and value of applying the engineering approach to speed control and regulation. In one state, for example, engineering studies were made of every speed zone on state highways in which the value speed limit differed from a recently changed statutory limit of the absolute type. As a result of the studies, the speed limit was raised for some 1,167 speed zones, lowered for 23 others, and left unchanged in 619. In each instance, the 85 percentile speed of vehicles was used as the major basis for determination of the proper limit.

Before-and-after studies by the highway department at 30 locations where the speed limit was raised revealed the following:

1. The 85 percentile speed of vehicles decreased 0.2 miles per hour.
2. The speed differential (range of speed of 70 per cent of the vehicles) was reduced by 0.3 miles per hour—indicating a reduction in overtaking and passing manoeuvres.
3. The proportion of motorists observing the posted speed limit increased from 38 per cent to 84 per cent.
4. The number of motor vehicle accidents in these zones decreased from 62 to 40 (or 35 per cent) after the speed limits were raised.

Similar studies at four representative locations where the speed limit was lowered indicated that:

1. The lower speed limit had little effect on traffic behaviour.
2. The speed differential increased by 1.3 miles per hour.
3. Voluntary observance of speed limit signs decreased about 10 per cent.

Policeman operating electrical timer which determines speed between tubes strung across road.

The highway department drew conclusions from its studies that were similar to those of other traffic authorities; namely, that:

1. Increasing the numerical value of the posted speed limit does not of itself result in higher vehicle speeds.
2. Little change in the traffic speed pattern results from increasing or lowering the speed limit.
3. Realistic speed limits result in greater voluntary observance by motorists and, thus, make possible a workable enforcement programme.
4. Higher speed limits do not increase accidents when the limits are based upon a proper engineering study.

While speed zoning normally has its greatest application in rural areas, an engineering approach to speed control, emphasizing the 85 percentile criterion, is desirable in urban areas as well. Before-and-after studies of the results of extensive changes in speed limits in cities through speed zoning have revealed effects consistent with those cited above.

There are also numerous examples of the adverse effects of establishing speed limits on bases other than a proper engineering study. In one instance, and contrary to engineering judgment, a 40-mile-per-hour speed limit was reduced to 25 miles per hour in the mistaken belief that this would substantially lower vehicle speeds and improve traffic safety. Before-and-after studies showed that the average vehicle speed was 7 miles per hour higher after the 25 mile-per-hour limit was in effect than when the 40 m.p.h. limit was posted. Moreover, under the 25 m.p.h. limit, there was a much greater differential in vehicle speeds and less efficient traffic flow.

Effect of Enforcement

The opinion has often been expressed that strong enforcement measures can effect increased observance of speed limits, regardless of their reasonableness. However, as implied by the results of studies noted above, the vast majority of motorists will not obey unwarranted or unreasonable speed controls, regardless of any form of coercion that may be applied.

Results of a study recently conducted by a top-ranking police organization in the United States, in co-operation with highway authorities, indicate that enforcement of speed limits in itself does not necessarily have any significant effect on driving speeds. This research involved analyses of vehicle speeds on approximately 200 miles of a rural state highway on which a 65 m.p.h. daytime speed limit was in effect. Vehicle speeds were recorded when police enforcement was minimal, and then when concentrated enforcement patrols were in operation. A report[3] on this scientific study of the relation of enforcement to speed, presents the following conclusions:

1. There is no evidence that enforcement at the levels used in this series of tests causes the average speed of vehicle to decrease significantly.
2. The number of drivers exceeding the legal speed limit does not decrease with enforcement.
3. The variance of vehicle speeds about the mean is not significantly affected by an increase in enforcement activity.

Thus, the importance of establishing reasonable speed limits is again supported by research data, in yet another phase of speed control.

Conclusion

Motor vehicle speed control is an extremely important element in achieving safe and efficient traffic movement. It is an engineering matter requiring a scientific approach—and therefore is a logical and proper responsibility of traffic engineers. An essential first step in engineering for speed control is the vesting of adequate authority therefore in the appropriate agency. Proven speed zoning practices and principles should be utilized everywhere (or more and more extensively) in determining speed limits that are reasonable and safe for the particular highway section involved. Periodic re-evaluation of speed limits and their propriety is desirable, particularly when there is a change in prevailing traffic conditions or in other factors influencing safe travel speeds.

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[2] 'Accident Facts—1959 edition', National Safety Council, Chicago, Illinois.

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BEFORE and AFTER STUDY...

SOME EARLY RESULTS from the LONDON—BIRMINGHAM MOTORWAY

THE meeting of the Institution of Civil Engineers held on May 3, 1960, was devoted to the London-Birmingham Motorway. Among the papers given was one by Sir William H. Glanville, which was based on the studies made of the traffic and economic aspects of the construction of the Motorway which had already been published[1]. The research is continuing and in introducing his paper Sir William gave some figures obtained during the first months of operation and compared them with the earlier predictions. In doing so he stressed that it was early yet to talk about the predictions as compared with actual operating results, but a considerable and important study was being made to try and evaluate what was happening, and what would happen in the first year as against the predictions. It was hoped to publish a paper later. Meanwhile some of the figures given by Sir William, together with explanatory statements based on his remarks when presenting his paper, are reproduced.

Fig. 1 below compares the predicted and actual operating figures, mainly for March, 1960.

LONDON - BIRMINGHAM MOTORWAY
PREDICTED AND OBSERVED TRAFFIC

	Vehicles per 16-hour weekday March 1960		Actual as a percentage of predicted
	Predicted (ignoring generation)	Actual	
NORTH OF FRIARS WASH (Herts)	17 600	16 600	94
NEAR NEWPORT PAGNELL (Bucks)	13 900	12 600	91
BIRMINGHAM SPUR (Northants)	7400	6 700	91

In the studies made beforehand, since it was difficult to decide what speeds should be assessed for the various classes of vehicles, speeds were measured on comparable motorways in Belgium, France, the Netherlands and Western Germany. To check the mean speeds on the likely application to this country information was also obtained from the Preston By-Pass where actual speeds were somewhat lower for the goods traffic, but a little higher for cars and light goods traffic. One feature which had been revealed on the Motorway was the higher speed of cars on the London-Birmingham Motorway than the speeds recorded for other motorways. The Motorway speeds were in fact about 5 m.p.h. greater than the average speeds recorded elsewhere, both for cars and for light goods vehicles. The Motorway speeds for medium goods vehicles were about the same as in Germany and the Netherlands. The speeds of the heavy goods vehicles were slightly lower but considerably higher than the values assumed for economic assessments.

Fig. 2 *below* gives the comparisons.

MEAN SPEEDS ON STRAIGHT LEVEL SECTIONS OF MOTORWAY (mile/h)

Class of vehicle	Belgium and France (June '57)	Netherlands and W. Germany (June '57)	Preston By-pass (May '59)	London-Birmingham Motorway (Jan. '60)
CAR	52	54	53	59
LIGHT GOODS	42	45	46	49
MEDIUM GOODS	37	41	37	40
HEAVY GOODS	35	38	33	36

Fig. 3 below shows the mean journey speeds, including those assumed for 1955 conditions. The research was begun in 1955 and took a considerable time to complete. The actual measured speeds on the roads by-passed by the Motorway, in September 1959, before the Motorway was opened, are also given. The observed speeds towards the end of 1959, soon after the Motorway was opened, were about 5 m.p.h. higher than the speeds assumed for the 1955 conditions.

MEAN JOURNEY SPEEDS ON LONDON-BIRMINGHAM MOTORWAY AND ON ROUTE A.5/A.45 (mile/h)

Class of vehicle	LONDON - BIRMINGHAM MOTORWAY		LENGTH OF ROUTE A.5/A.45 BY-PASSED BY MOTORWAY Sept. 1959 (before opening of motorway)
	Assumed for 1955 conditions	Observed Nov. 1959	
CAR	50	57	35
LIGHT GOODS	40	45	32
MEDIUM GOODS	35	39	30
HEAVY GOODS	30	35	28

[1] *T. M. Coburn, D. J. Reynolds and M. E. Beesley 'The London to Birmingham Motorway traffic and economies'. D.S.I.R., Bd. Reg. Lab. Note No. RN/3552/1959.*

MEAN SAVINGS IN TIME FOR JOURNEYS BETWEEN LONDON AND BIRMINGHAM TRANSFERRING TO MOTORWAY (minutes)

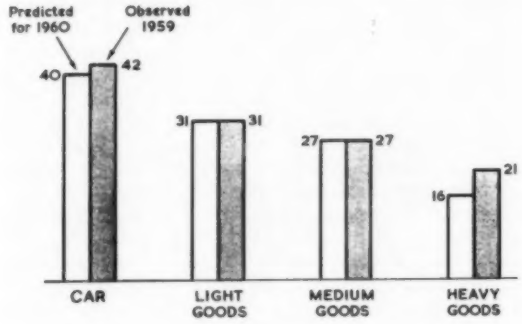


Fig. 4 above shows the results in terms of time saved in making a journey between London and Birmingham and are applicable to a journey from Marble Arch to New Street. Not only are these figures relevant to a journey transferred to the Motorway from the A5 or the A45, but also to most journeys from Greater London to a large area of the Midlands. The principal exceptions were journeys starting west or north-west of London and finishing south of Birmingham. These time savings were also applicable to journeys made for greater distances in the same direction, for example, all journeys between London, Liverpool and Manchester. The savings in time were fairly considerable, and for cars were 42 minutes observed as against 40 minutes predicted; for light goods vehicles and for medium goods vehicles the actual savings were as predicted, and for heavy goods vehicles 21 minutes observed as against 16 minutes predicted.

PREDICTED AND OBSERVED CASUALTY RATES PER MILLION VEHICLE-MILES

	LONDON - BIRMINGHAM MOTORWAY		A.5
	PREDICTED	OBSERVED* Nov. '59 – Feb. '60, incl.	1956
FATAL	0·06	0·11	0·15
SERIOUS	0·6	0·4	1·2
SLIGHT	0·8	0·9	2·1
TOTAL	1·46	1·41	3·45

*Because of seasonal variation, the rate for the whole of 1960 is expected to be about 10 per cent lower

Fig. 5 above gives a comparison between the predicted casualty rate per million vehicle miles and the observed. The casualty predictions for 1960 were 1.5 per million vehicle miles on the Motorway. For the period from November 1959 to February 1960, the figure was 1.4 which was the latest available. This figure, however, might well be on the high side, because when seasonal variations are taken into account, it would be found to be lower for a full year. The initial outcome, therefore, was a casualty rate of 1.4 per million vehicle miles, compared with a predicted figure of 1.5. When the A5 casualty rate of 3.4 was borne in mind, it was clear that the Motorway was a very safe means of travel. The casualty rate had, therefore, been considerably more than halved, and as the Motorway is only just beginning it might well be that time will show that even the initial improved figures could be further improved considerably with experience. Even so, the figure to date is a good one compared with American and other experience.

CHANGES IN FUEL CONSUMPTION FOR JOURNEYS TRANSFERRING TO MOTORWAY

	Percent increase (+) or decrease (–) in fuel consumption	
	SMALL CAR	LARGE CAR
PREDICTED based on 1955 conditions and assumed motorway speed of 50 mile/h	+3	–16
OBSERVED 1959–60 at actual operating speeds	+17	–4

Fig. 6 above gives comparison of fuel consumption which was one of the matters that was taken into account in making an economic assessment of the value of the Motorway. In making predictions for the small car, it was calculated that the fuel consumption of small cars would go up by 3 per cent when using the Motorway. The observed value, by actual trials carried out since the Motorway was opened, was an increase of 17 per cent, largely on account of the increased speed. For large cars, a petrol saving of as much as 16 per cent had been predicted, whereas in practice it appeared to be only a 4 per cent saving. This, again, was because of the increased speed, and it affected the economic assessments made.

ESTIMATED BENEFITS OF LONDON - BIRMINGHAM MOTORWAY 1955 Traffic Levels (Excluding generated traffic)

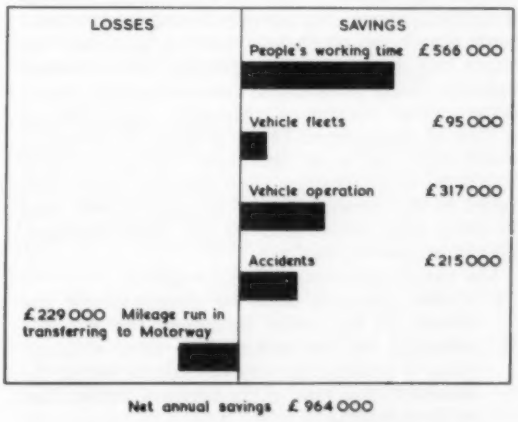


Fig. 7 above shows the predicted savings and losses but does not give the whole story, because there are many factors that cannot yet be put into the balance.

PLANNING AN URBAN ROAD IN SPANDAU

by WERNER LEIPOLD,

assisted by HERBERT LIMAN

Against the background of the difficulties of traffic planning in a divided city, these two traffic engineers of the Building and Housing Board of Berlin describe the application of traffic engineering techniques to the road and traffic problem of the Berlin District of Spandau.

BERLIN'S situation presents special problems for traffic planning. The city has to face a difficult task in making a traffic prognosis covering the entire Berlin area because since West Berlin is separated from its hinterland, as well as from the Eastern Sector, development of traffic conditions is not normal. The objective is to find a reasonable solution of road traffic problems. Figures of development of road traffic are available from the German Federal Republic and West Berlin, but corresponding information for Eastern Germany and East Berlin is not available.

The existing network of highways leading to Berlin, which will be completed with the construction of the Berlin inner-ring urban motorway and the new Berlin-Hamburg autobahn, will be adequate for future long distance traffic, especially if the Federal highway system is extended correspondingly. Inner Berlin traffic conditions, however, are different in view of the prospect of the reunion of Germany, which will result in an enormous increase of traffic within the city. Modern town planners must have regard to the requirements of increasing traffic and therefore must be assisted by the traffic engineer. This is accepted in Berlin.

The special situation of Berlin requires:

1. Traffic planning must be developed for the whole of the town including the possible influence of the surrounding area, although plans at present can only be realized within the administrative area of the Senat of Berlin, that is West Berlin.
2. The planned inner urban road network must not only meet the present requirements of continuously increasing traffic within one part of the town, i.e., West Berlin, but must also be based on the future requirements of a reunited town, with restoration of unhindered entrance of traffic into Berlin from all sides.

Up to 1953 traffic planning in Berlin was based on a motorization index 1:10 (one vehicle per ten inhabitants). The recent increase of motorization, however, has exceeded all estimates, and in 1954 a motorization index of 1:5 was adopted for future traffic planning. The estimates of future traffic volume must, of course, take into account public transport, but details of this are not given here for reasons of length.

Present Road Traffic

Because there is practically no through traffic in Berlin, traffic planning is based on its interior traffic which is characterized by traffic direction (origin and destination) and traffic volume. Traffic streams are determined by the well-known method of finding the desire line of traffic by means of traffic surveys. The individual streams can be adjoined to the existing road network by individual road traffic counts. Comparison of individual travel times results in finding the volume and value of the planned road network. The influence of new built-up areas or rebuilt areas on traffic structure can be obtained by analogical conclusions. On July 1, 1959, the motorization index was 1:12.9 in Berlin. According to a prognosis based on a logical function of the dependence on time and social product, the motorization index will be 1:6 in 1971, and will increase to 1:5 thereafter. (Greater London was 1:6.4 in September 1957). The result is that the traffic volume of 1959 will be doubled within ten years.

Traffic after Reunion

Because of the separation of Berlin, and since pre-war statistics are not available, it is not possible to work out a traffic prognosis for traffic after reunion based on traffic surveys only. A special method has been developed by Professor Dr.-Ing. B. Wehner. Since professional traffic (travel of working population) as a special category is a most important part of the total traffic (peak-hour traffic) influencing the measurement of roads, this method supposes certain traffic relations between inhabitants living in one district and the district where they work. By means of assumed speed for the individual category of road and comparison of travel time, traffic relations can be obtained and transferred to the planned road network. By consideration of the degree of motorization, working time etc., the traffic volume on the individual road can be calculated. This method may be refined for special purposes by considering further facts, e.g. the limited capacity of certain road sections etc. Consequent use of these methods will provide a base for reasonable road planning.

Major Road System

Berlin traffic surveys have provided a major road system (Fig. 1 at the head of this article) which consists of an urban motorway ring with full control of access and grade separations at intersections, four city-tangents and the autobahn-connection roads. Construction of such a major road system would, however, be no adequate solution for general urban surface traffic, and normally an urban motorway system such as this requires the backing of an adequate general urban road network.

A report about the above mentioned urban motorway system will be given in a later article, the purpose of this article being to explain the contribution of the traffic engineer to the planning of an urban road.

Urban Road Plan, Spandau

The district of Spandau is located at the western outskirts of West Berlin. Compared with other districts of Berlin, Spandau has a different geographical location and a different economic development, more or less based on the historic development of the former town Spandau. Thus still today Spandau is to be regarded as an independent town-unit within the City of Berlin. It is connected to its neighbour districts by three east-to-west main roads, the traffic within Spandau being mainly operated by a major north-south road.

The location of this main road, of the housing estates, the industrial and trade centres, the business and administrative centres, and equally of the railways and stations, causes the majority of all traffic to flow through the old Spandau town centre, which is the actual district centre today. The narrow old roads of this district city, however, are not adequate for such continuous increasing traffic. Further increase of inhabitants and motorization will bring more problems and lead to greatly increased congestion. This would mean reduction of business, trade, and economic life and thus the old city of Spandau would lose its significance and economic value as a centre of the district organism. To avoid this the traffic problem requires a long-term solution.

Two different principal solutions had to be considered:

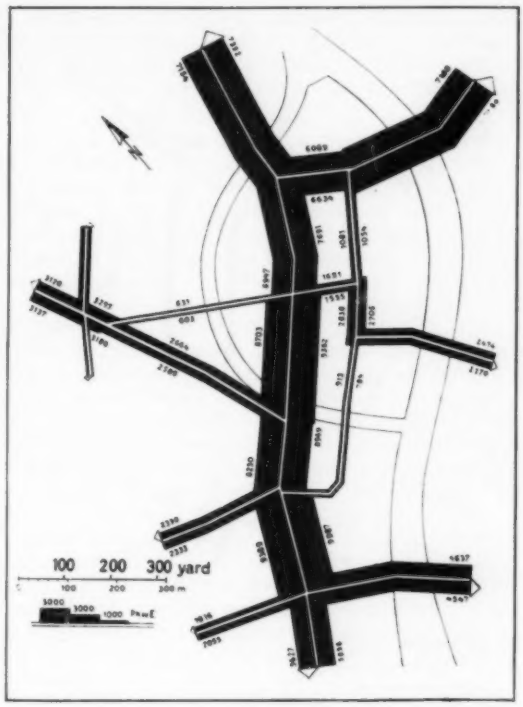


Fig. 2.

1. Extension of the city road network in connection with traffic control and including one way streets but in such a way that traffic would still pass the old Spandau centre.
2. Separation of through traffic from inward and outward traffic and diversion of through traffic on ring roads.

Prior to any further consideration it was necessary to make a proper survey of the present traffic situation in order to foresee the future traffic volume for each of the two proposals. A prognosis, based on the traffic analysis described below, made possible a decision on the technical value of each proposal with adequate accuracy. In addition the possible influence of inward traffic from the surrounding Soviet Zone was taken into consideration.

Traffic Survey and Analysis

Results of normal traffic counts of 1951/1955 and 1957 and a count of origin and destination arranged in August 1957 were already available. To find the exact future traffic volume for both designs the following traffic survey was carried out by cordon count around old Spandau city:

(*a*) Origin and destination count by means of an external study (interviewing of drivers) and by means of the distribution and collection of registered tickets.

(*b*) Normal traffic count.

The volume of inward traffic during a period of 12 hours amounted to 37,000 passenger car units. Total traffic in passenger car units was split up by detailed analysis as follows:

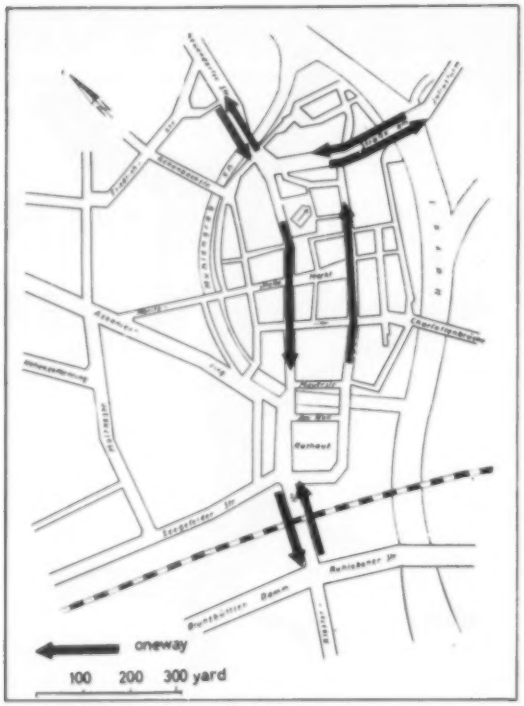


Fig. 3.

(*a*) destination traffic on the eight roads leading into the city (down-town terminal traffic),
(*b*) through traffic,
(*c*) through traffic with intermediate destination (interrupted through traffic),
(*d*) origin of destination traffic,
(*e*) origin and destination of through traffic.

The following general results were received:

(*a*) Down-town terminal traffic, 20 per cent of all passenger car units,
(*b*) through traffic, 71 per cent,
(*c*) interrupted through traffic, 9 per cent.

Furthermore, details of inward traffic originating from other districts were obtained. Traffic counts confirmed traffic relations between 13 points of the count as well as between the points of the count and the old city. This resulted in 169 individual traffic relations for the inward traffic. These relations were demonstrated by six partial traffic-flow diagrams, which were combined to one plan showing the total traffic diagram (see Fig. 2). The uncounted originating traffic was added to the terminating and through traffic to the same amount as the counted terminating traffic but in the reverse direction. Thus the total-flow diagram considered the inward and outward traffic but not the local traffic, which was of little significance because of the rather small area of the survey.

To distribute the traffic streams according to the two alternative proposals it is assumed that the width of roads is adequate for traffic. The basis of the distribution according to proposal No. I is the diversion of traffic to a one-way road system, the basis for the distribution according to proposal No. II is the design of a new by-pass road in connection with comparison of running times. Similar to the first analysis, six partial traffic-flow plans of the inward traffic were developed for each proposal. These partial diagrams were again combined to a total traffic-flow diagram.

Public transport would have to follow the one way regulation of proposal No. I. Under proposal No. II it would have to be considered which of the lines should be diverted to the by-pass and which should still pass through the city; which lines should be altered and whether streetcars should be replaced by buses. Relief of surface traffic by a new subway line would have to be considered as well.

Proposal No. I—One-Way Traffic

The diversion of traffic is demonstrated by Fig. 3. The combined total traffic-flow diagram is shown in Fig. 4. For the south-north main road a traffic volume has been calculated which will vary between 9,300 and 17,500 passenger car units per 12 hours within the individual road sections. Comparing the traffic volume of the analysis with the above design of traffic volume of the prognosis, it becomes obvious that the one-way regulation causes considerable detours for destination traffic and through traffic with intermediate destination, which, on the other hand, raises the total volume on the roads.

Introduction of one-way regulation requires diversion of trams and buses. This results in an additional traffic volume during peak hours. This diversion will, furthermore, cause considerable expense. In addition, some of the trams will have to follow a left-turn line, which is unavoidable, even if they were replaced by buses. This on the other hand would cause the doubling of the number of buses. Surface traffic can possibly be discharged by sub-pavement trams, the tunnels of which could later be used by the normal subway line.

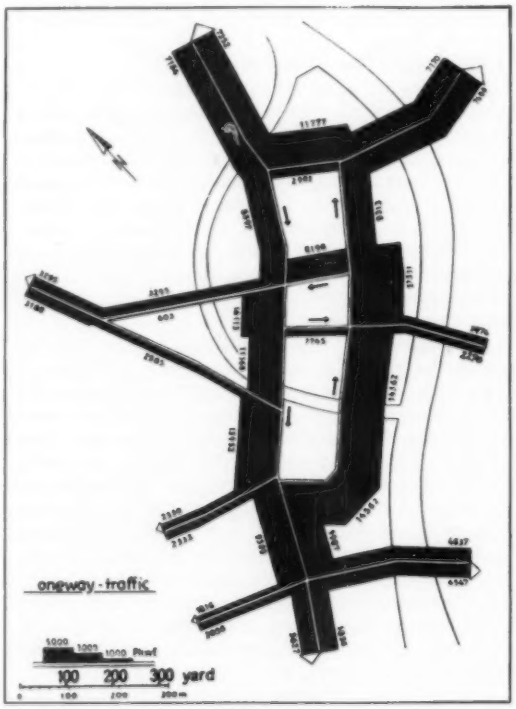


Fig. 4.

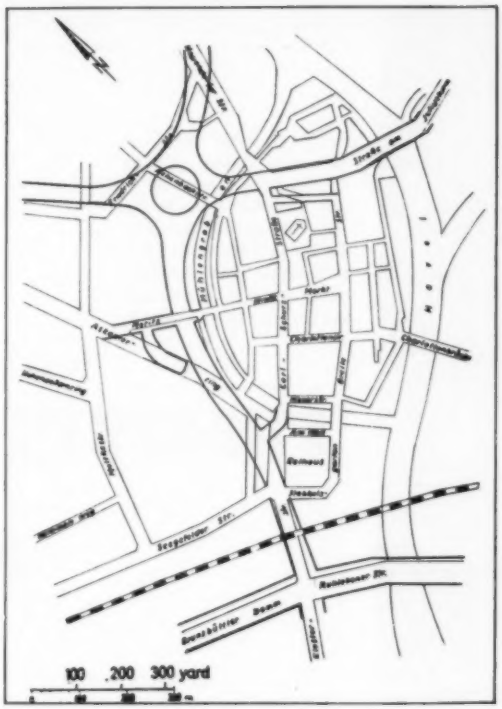


Fig. 5.

Proposal No. II—By-Pass Road

The design base is shown in Fig. 5, the total traffic-flow diagram is shown in Fig. 6. The city would be relieved of through traffic, and the by-pass would be large enough to carry 8,500 passenger car units in one direction within 12 hours on that section which would have to take the heaviest traffic volume.

A further relief to the city is offered by replacing some tramway routes by buses and by diverting this traffic on to the by-pass. The long-term planning of the extension of the Berlin subway line also includes a new subway to Spandau, although as at present proposed it would only touch the periphery of old Spandau. Construction of a subway tunnel along the existing narrow old roads of the city would be very uneconomic because of the bad subsoil and the many difficulties involved in gaining possession of private ground properties for building purposes. It would be easier and cheaper to construct a subway tunnel underneath the new by-pass. It could be constructed faster and bring greater relief to surface traffic.

Results of Traffic Survey

The research is based on a doubled traffic volume. This would correspond to a motorization index of 1:5. Additional traffic which is to be expected after the reunion can also be calculated with adequate accuracy.

Proposal No. I—One Way Regulation

2,900 passenger car units per peak hour through the city from north to south would have to be provided for. To meet this a carriage-width of 17 metres would be required, while a width of only 11 metres is available.

From south to north a volume of 3,020 passenger car units per peak hour on some sections of the main road would also require a width of 17 metres, while only 9 metres are available within these sections.

Proposal No. II—By-Pass Road

The main traffic road within the city will have in this case a volume of 1,620 units per peak hour for which the existing carriageway of a width of 11 metres is adequate. The by-pass would have to allow for a maximum peak hour volume of 2,000 units in each direction. Three lanes in each direction, therefore, are recommended.

Comparison of Two Proposals

With regard to proposal No. I, traffic flow through the city can only be met by widening the existing roads, even if buses replaced trams and a subway were built. Such widening, however, could only be carried out by demolition of existing buildings. Furthermore, the reduction in parking space, already inadequate, would adversely affect the character of the city as a business and shopping centre.

Proposal No. II would mean a considerable improvement by relieving the city of through traffic. Only a few buildings would have to be removed and the parking space, required for the development of business in the city, could be provided together with the construction of the by-pass along the periphery of the city.

As a result of the above traffic survey it has been decided to construct a by-pass road. The first building stage comprises a temporary southern connection to the existing road network and to the new circuit to the north. The second (eastern) carriageway will be carried out after construction of the subway tunnel underneath it. Construction work was commenced in autumn 1959 and will be completed in 1962.

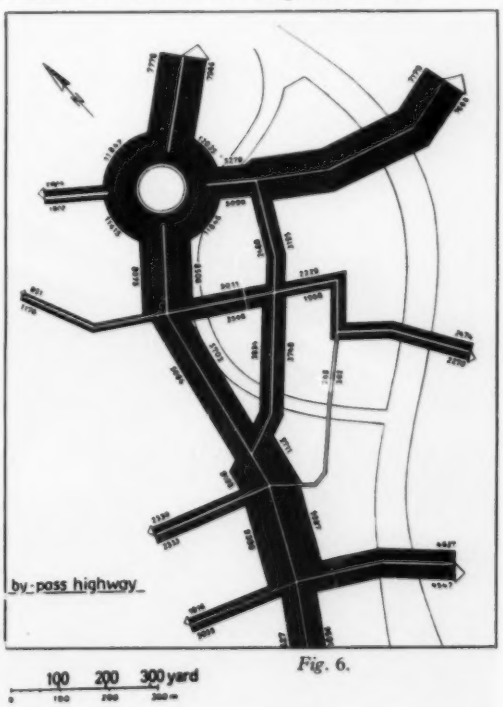


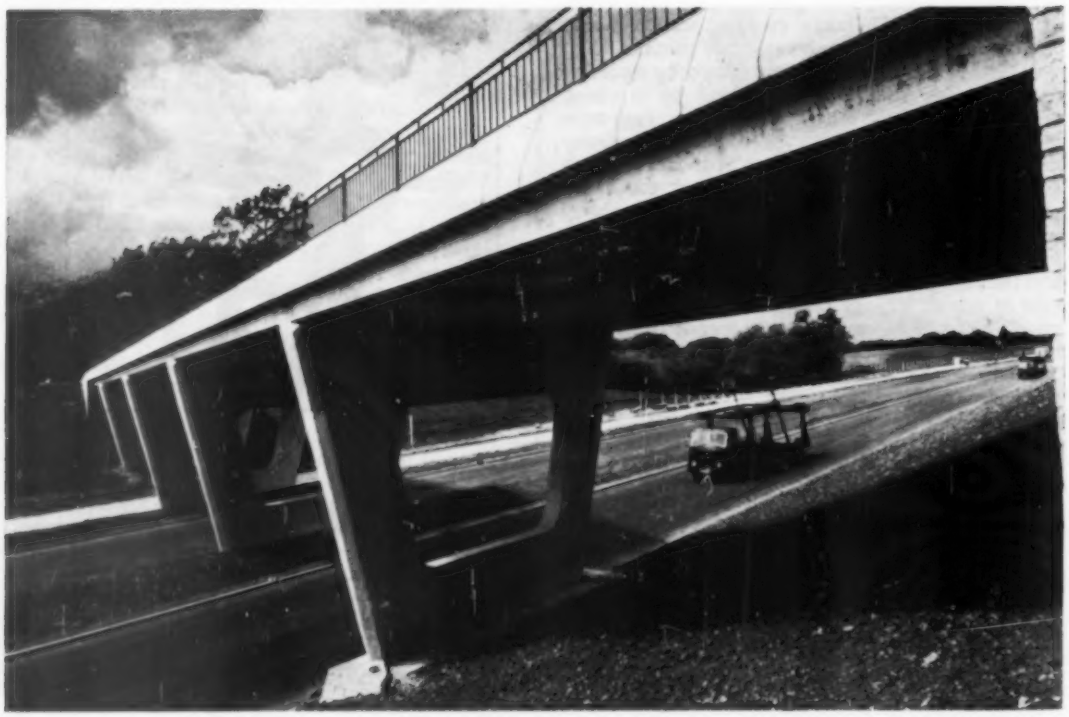
Fig. 6.

The graceful curve of motorway (shown on left) is part of the approach to the North Bridge over the River Rhine at Dusseldorf in Western Germany. This is a section of the extensive road network now under construction in the city.

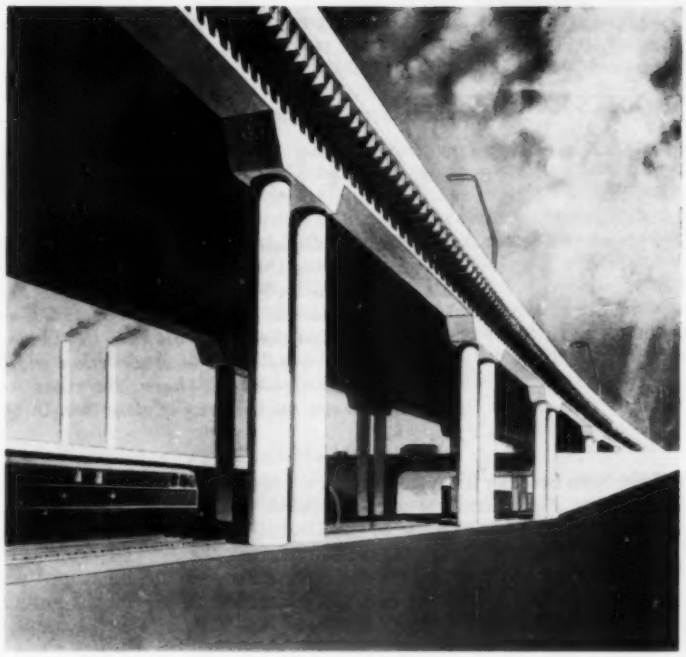
PROJECTS AND AC

IN PI UR

The five span bridge which carries the old London—Oxford Turnpike over the new Oxford Eastern By-Pass. As at Queenhill (shown opposite) elegance and utility have been successfully combined.



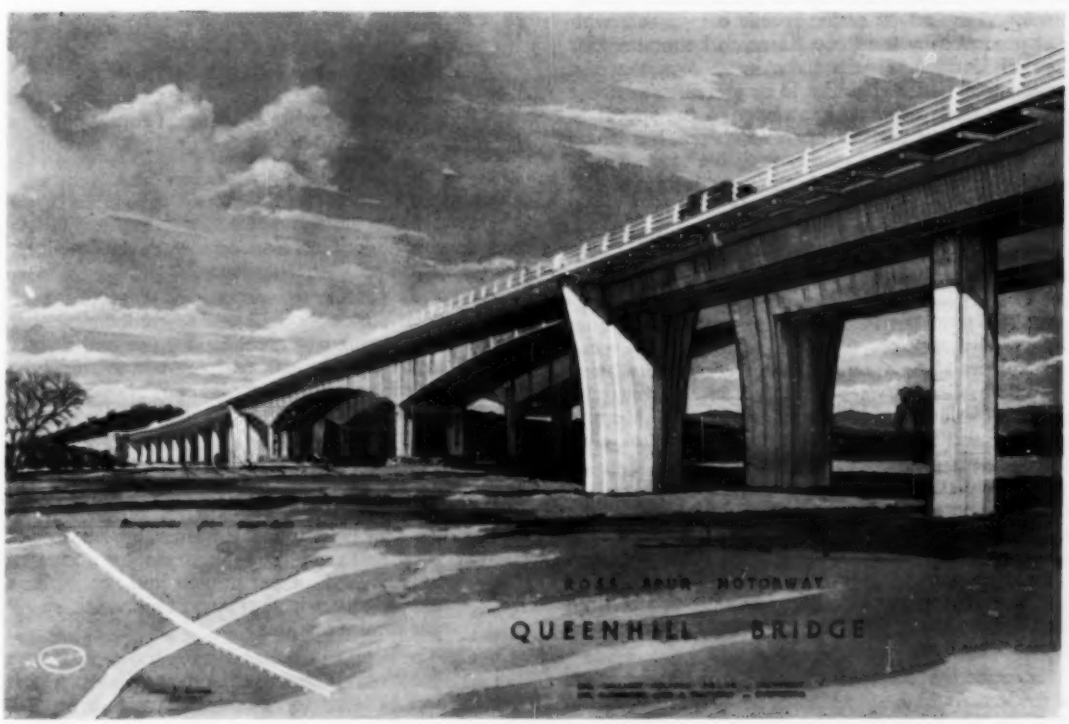
On the right is an impression, issued by the Ministry of Transport, of the proposed viaduct over the railway through Oldbury and Smethwick. This would be three miles long and form part of the future Birmingham—Bristol Motorway.



ANDACHIEVEMENTS

PIURES

The Architect's drawing of the bridge now under construction at Queenhill on the Ross Spur Motorway. The elegance of the treatment of columns and arches is a fine example of the best contemporary bridge-building in this country (Architect: Sir William Holford, F.R.I.B.A.).



R. J. SMEED, B.Sc., Ph.D., F.S.S., A.I.C.E.

Reports on his

VISIT TO THE UNITED STATES

Dr. Smeed, Deputy-Director, Road Research Laboratory, visited the United States in December 1959 to attend a symposium on The Theory of Traffic Flow organized by the Research Laboratories of the General Motors Corporation at their Detroit Proving Ground and, in the limited time available, to study road traffic and safety problems and research there. He gives here some impressions on the traffic situation in the U.S.A.

IT has been noted by many people that the layouts of the towns in England are not, in general, as well adapted to traffic flow as those of the United States. But despite the better layout of American towns, the employment of traffic engineers and very extensive road building, the Americans have not succeeded in solving the traffic problem in towns. They have succeeded in getting more private cars into the towns, but it is not obvious that the speeds of the traffic in their towns are higher than in ours. Little factual information is available about relative speeds in the towns of the two countries.

Speeds in U.S. Towns

I tried to obtain information on speeds in U.S. towns, but found difficulty in doing so. None of the major towns appeared to have a comprehensive set of published figures on traffic speeds comparable with that produced by the Road Research Laboratory for Central London. I gained the impression that the responsible traffic engineer in any area did have a probably fairly accurate knowledge of the speeds of traffic at various parts of his road system, but it was not written down in a readily available form. Meanwhile, I was anxious to obtain what information I could and asked a number of people for their journey times to work. It was fortunate that one of the officers of the United Kingdom Scientific Mission had kept some figures of his daily journey by car into and from the U.K. Scientific Mission in down town Washington. The total length of his journey was 9.3 miles from Falls Church, Virginia. His journey speed varied from 11 to 26 mile/h., the average speed being 18 mile/h. Speeds were invariably low during rain, about 11 mile/h., and were also low on Monday morning and Friday evening. In the New York area, three regular journeys of lengths 22, 27 and 35 miles, were completed at average speeds of 33, 25 and 28 mile/h. These speeds are rather higher than those given by the Editors of the Fortune magazine who state that the average speed out of New York and other large towns is about 20 mile/h. I was told that traffic moved at between 20 to 25 mile/h. along 6th and 7th Avenues, New York, during the rush hour when things went well.

It seems that the journey to work is often made at a moderately high speed in towns in the U.S.A. but there is plenty of evidence that in the centres of the down town areas speeds are sometimes very low. In Detroit speeds are sometimes fairly fast, but it took 40 minutes to do a ten-mile journey on the first morning I was there, when there was a trace of snow on the ground. This was presumably partly due to a few nervous drivers slowing down large numbers of others. On a Sunday afternoon it took nearly an hour to go round one block in New York. An article in the New York Daily News, November 23, 1959, reported that a team of reporters spent days riding all types of surface transportation in New York. They concluded that 'at certain times and in certain areas of the city, it is faster to walk than to go by cab, car or bus, if the journey is short'. They referred to one journey which took 11¾ minutes by bus, 8½ minutes by car and 13¼ minutes walking. They timed 23 buses for a ¾ mile journey and found that the journey time varied from 10 to 19 minutes. It is clear that the speed of traffic in the town centres is extremely variable.

It is of interest that about 520,000 motor vehicles enter Lower Manhattan, New York City, daily. The number of motor vehicles entering an equivalent area of Central London is about two-thirds of this number.

Traffic in New York

I was told that large amounts of industry and offices are moving out of New York and was given data from which it was possible to deduce that:

(i) The number of people entering Southern New York City daily was 3.3 millions. 75 per cent entered by public transport and 25 per cent by private transport. 88 per cent of those entering during the rush hour did so by public transport.

(ii) The number of people entering Southern New York City daily increased until about 1948 but declined between 1948 and 1956. The average rate of decrease in this latter period was 1.3 per cent per annum. However, the number of people entering by public transport decreased by 2.5 per cent per annum and the number entering by private transport increased by 2.9 per cent per annum.

(iii) The drop in the numbers entering was more pronounced during the off-peak hours and it was believed to be associated with a drop in

manufacturing and retail trade in the Central area. There was known to have been a very great increase in the retail trade in the suburban areas in New York. It appeared that office employment in central New York rose during the period, whilst there was no evidence that the attraction of Manhattan as an entertainment area was decreasing.

I gained the impression by talking to various people who have studied the subject that these trends in New York City are examples of nationwide trends. However, much larger proportions of workers enter by private transport in some towns than in New York.

Three papers by Frank W. Herring, the Deputy Commissioner for Comprehensive Planning at the Port of New York Authority are of interest: they are entitled

(1) *Planning and the Physical Sciences.* (2) *Urban Transportation Tomorrow.* (3) *Urban Passenger Transport, Public and Private.*

(1) Views on Land Use

Mr. Herring believes that the proportion of the total population living in urban areas is increasing rapidly and that this is due to technological advances in communication systems, power generation and transmission and transportation which have multiplied greatly the amount of land available for urban use; it has done this by making usable millions of acres that were inaccessible at an earlier date. The advances in manufacturing processes have brought a demand for one-storey buildings and that partly in consequence of these technological factors but also partly because of a natural desire for increased amenities, land is being used extensively rather than intensively for both residential and industrial processes. Everything urban has come to demand more space; housing and industry have gone suburban. Between 1900 and 1940 the increase in population by one person involved the conversion of open country to urban conditions of 220 square yards. Between 1940 and 1954, each additional person in the area involved the urbanization of 450 square yards. It is believed that, at present, each additional person in the area involves the urbanization of about 530 square yards.

The old established central areas of large cities have become stabilized both in population and employment; any growth is slight. Both population and employment are growing rapidly in the outlying areas. The suburban areas are becoming industrialized and are becoming employment centres as well as dormitory areas. Residential and industrial development in the growth areas is at a low density—the result of the vast spatial organization and a pronounced loosening of the urban fabric.

(2) Leisure Time Travel

Mr. Herring points out that weekend and holiday travel have been captured by the automobile. The great problem is that of providing enough arterial capacity, enough highway lanes to accommodate the volume of traffic flowing outwards from the city when the leisure time period begins and back into town when the holiday is over. In some cities the maximum demand on travelling facilities, and the traffic volumes which control the design of the highways, occur during leisure time periods. He states that almost 45 per cent of the total annual passenger volume crossing the Hudson river is represented by passengers on Saturdays, Sundays and holidays. Weekends, holidays and vacations now amount to about a third of the days of the year. It is likely that the leisure time travel will increase.

Weekday travel in non-peak hours. The automobile is the principal mode of transport during the non-peak periods. On weekdays, apart from the rush hours, Mr. Herring thinks that the traffic volumes, although high, are not of controlling magnitude and the highways have little trouble in meeting the demands made on them. The public transport has a light role compared with what it is capable of. The most noteworthy problems, he suggests, are those of providing parking spaces for down town businesses and maintaining the fluidity of down town streets.

(3) Rush-Hour Travel

In the rush hour, he suggests that mass transportation may dominate. About 90 per cent of the peak travel in the New York area is accounted for by the railways, the subways and the bus lines. In Chicago, where it is 78 per cent, Philadelphia and San Francisco, the common carrier also dominates although the proportions are not as high as in New York. He states that even in Detroit and Los Angeles the proportion of people carried by public transport in the rush hour is more than 50 per cent. He suggests, however, that travel towards the town centre in the rush hour is not rising appreciably or has a growth rate far lower than that of other types of travel in the urban areas as a whole. Mr. Herring points out, however, that it is not only the rush hour travel towards the centre that is important. The journey to work in the reverse direction is important in amount and is increasing. Most of this travel is by automobile and this has caused difficulties of parking in industrial plants. Public transport is most important in cities where the central business district is of most importance relative to the region as a whole.

(4) Public Transport

The high utilization of public transport is for brief periods during five days a week. As the cost of providing this transport is largely determined by the facilities required to accommodate a maximum load, there is usually a great gap between passenger revenues and overall cost. The financial distress of the public transport systems stems not from their loss of passengers for the journey to and from work but from their loss of almost everything else. If fares are raised to balance the costs, there would be further diversions to automobile travel and the measures taken would be self-defeating. Further, there is little prospect of growth in travel to the town centres. Mass transport suffered a severe blow when the five-day week came into effect. It accounted for one-sixth of the decline in revenue with no decrease in peak demand. If, in the years that lie ahead, we are to have still shorter working weeks, total mass transport will decline again. The goal of public policy should be that of minimizing the total cost to the metropolitan community for passenger transport and he believes that the acceptance of deficit operations in mass transit may easily be the wise course.

(5) Parking

A small increase in the number of automobiles entering the central business district in the morning and requiring all-day storage can overtax the parking facilities. Whilst the floor space requirement for employees in office work today is 120 square feet, 300 square feet are required for an automobile which can, of course, carry several people.

Mr. Herring concludes that the future large city may consist of:

(i) A central zone within which high travel densities can justify the provision of special facilities for the exclusive use of mass transportation;

(ii) an intermediate ring within which there might be buses operating on limited-access expressways;

(iii) the outer reaches of the metropolitan region and areas lying between radial routes, where passenger travel becomes widely dispersed and where it can be accommodated by the normal type of highway network.

Mr. Herring also thinks that there will be a rapidly growing volume of passenger movement from one suburban location to another. Some of these travel paths may develop densities that will warrant public transportation service, and it is desirable that urban expressway systems should be planned with these considerations in view.

Traffic Control

One-way streets and traffic signals are used very much more in the U.S.A. than in Britain, e.g. in Manhattan, most of the avenues and practically all the cross streets are one way. In the towns I visited, sets of signals were often connected together to form a progressive system and the system usually worked quite well. I was driven along various roads in New York, Washington and Baltimore and we drove long distances without stopping. The co-ordination of the signals would thus seem to be good, but different systems of control were used in the different towns.

At Baltimore there is a control room where the 850 traffic signal installations are controlled by eight master controllers. This is done on information received from four detectors strategically placed, two counting inbound traffic and two outbound traffic. Dials in the control room showed the number of vehicles per hour (based on traffic passing during the last six minutes) at each of the four detectors. The measured traffic volumes were used to classify the traffic pattern into types taking into account whether the main flow was inbound, outbound or approximately equal in the two directions, and whether it was light or heavy. This information was used to control the settings of the signals automatically. At any given time, almost all the signalled intersections in Baltimore have the same cycle length.

In Washington, sets of signals are connected together in progressive systems, the detailed arrangements being centrally controlled on a weekly cycle by means of a paper tape. The traffic authorities in Washington believe that traffic repeats itself sufficiently well for it to be possible to predict traffic conditions. The apparatus used in Washington is therefore much simpler and cheaper than that used in Baltimore. In the case of 500 of the signals, the connections are by land line and only 86 are by radio. It is proposed, however, to connect another 500 signals and this will be done by radio, the cost being only a small fraction of that by land line. The radio frequency used is 450 megacycles and the Washington installation is claimed to be the first really large system in use for the control of traffic signals by radio. The systems of signals are adjusted to enable the traffic to move at between 20 and 30 mile/h.

Use of Numerous Signals

The Americans seem to be more lavish in the use of signals than we are. Thus, in Baltimore, population 1 million, there are 850 signalized intersections. In New York, population 8 million, 8,000 of the 30,000 intersections are signalized. These figures may be compared with Great Britain, population 50 million and about 4,000 signalized intersections. I asked about the use of the comparatively large number of signals and was told that in Baltimore they only put in a signal after a traffic engineering investigation and all other methods of control, e.g. stop signs, have been exhausted. The usual conditions were 750 veh./h. in an 8-hour period, a third of them being on one street. The usual warrant for a pedestrian signal was 750 pedestrians/hour on a main street, 250 pedestrians/hour on a side street, averaged over the eight busiest hours. Some of the New York authorities thought they had rather too many signals, but there was no suggestion of reducing the number in any drastic manner. I was, however, told that in the old times in New York, when the traffic was controlled by the police, the decision as to whether a signal installation should be installed was made by a patrolman. He would allocate one if someone demanded it and there was one in stock. It was now thought that some of these signals were unsatisfactory and many of them were obsolete, just having red and green indications. The authorities were trying to put more and more on to a progressive wave. At present, in a few cases, the traffic signals along a section of the road all turned green at the same time. The traffic authorities now thought this arrangement unsafe.

Use of Radar and Radio

There is an increasing tendency to use radar for detecting traffic on the grounds that the overall cost is cheaper than the use of rubber detectors. The use of radar avoids the cost of digging up the road and filling up with material and also the delay to traffic whilst this operation is being carried out. Radar detectors also, it is claimed, lasted longer than rubber ones. The speeds are not measured with the radar device used at signalized installations.

Position of Signal Heads

The signals in Baltimore were rarely put on sidewalks because it was thought that vehicles did not see them as well as those hung overhead. There was one signal head on each lane of a two-lane road, and a great effort was made to keep the various signals on a long straight road in line. When being driven through Baltimore, I noticed that it was possible to see the signals at an intersection, even when I was in a long queue of vehicles and a long way from the intersection.

I was told that the actual position of the signal head was very important. At one intersection, the accidents fell from 101 in one year to two in the following year when the signals were reallocated.

Traffic Control in General

I gained the impression both in Baltimore, New York and Washington that very senior officers were directly concerned with the day-to-day movement of traffic. The Traffic Engineer or one of his senior officers personally knew of any serious hold-up that was taking place and took appropriate and immediate action. In Baltimore, 75 vehicles of the traffic department are fitted with radios and report any traffic difficulties they experience to Headquarters. If, for any reason, the radio breaks down, it is possible to telephone from any of the 850 signals by land line to the control room. Any officer of the department travelling in one of his department's vehicles can talk by radio to the control room and report any difficulties occurring. Vehicles patrol various routes and report to Headquarters on the traffic situation. On my way from my hotel to the traffic department, I was slightly delayed by a team of workmen carrying out road repairs. In the course of conversation, the chauffeur told me that these repairs would have to be finished by 4 p.m. The traffic commissioner would only give permission for the work to be done on this condition.

Baltimore had made arrangements for dealing with adverse weather and arranged for the police, highway staff, the fire staff and the mass transit staff to be working in the same room for the operation of controlling the traffic. The full system had only been installed for about a year and it had only been in actual use on one day, but it seemed to be quite effective. The Traffic Department recorded from their own instruments and made their own forecasts. In Washington, a vehicle's driver getting into difficulties due to snow is liable to prosecution if the vehicle is not fitted with chains.

Some of the eminent American traffic engineers believe that the public are quick to grasp changes in traffic regulations and that the intelligence of the driving population should not be underestimated. They are therefore prepared for traffic regulations to change fairly rapidly and to give quite complicated instructions on traffic signs, e.g.

NO LEFT TURNS 7-10 A.M. AND 4-7 P.M.
EXCEPT TRANSIT VEHICLES

and on one pole

NO STOPPING ANY TIME, TRANSIT STOP, NO. 10, 28, 29, NO PARKING ANY TIME, NO STOPPING 7 A.M.-10 A.M., 4 P.M.-6 P.M., CARS TOWED AWAY

Organization of a Traffic Department

I obtained details of the organization for the control of traffic in New York. Traffic had been the responsibility of the Police Department until ten years ago, but the position was thought to be unsatisfactory and a special department under a traffic engineer had now been set up.

The Traffic Commissioner was appointed by the Mayor. The Deputy Commissioner was appointed by the Commissioner, and the rest of the staff were selected by the normal Civil Service procedure. The Traffic Commissioner was not subject to directives from the City Authorities, and had complete responsibility for the City's traffic. When the Traffic Department was criticized in the newspapers, the Commissioner would give out a news release on specified projects. This Department received annually 12,000 letters from citizens and groups. An engineering investigation was made on the subject of every letter received and an answer given on the basis of this investigation. The Traffic Department never refused to see anybody who had a complaint and always explained in detail the reasons for their actions.

The Traffic Department was responsible for signs and markings, one-way streets, prohibition of turning movements, the closing of streets to traffic, prohibition of parking, the control of commercial loading and unloading, the position of bus stops, etc. The Commissioner could change the traffic laws, including the putting on of speed regulations. This did not require action by the Council. The Commissioner had full responsibility, and the only check on his powers was that he served at the pleasure of the Mayor, and could be removed by him. However, as a matter of practice the Commissioner would normally consult the Mayor and the Board of Estimates, i.e. the Council. Houston, Texas, was the only other town in the United States in which the Traffic Commissioner had similar powers. The Traffic Department had 480 employees, most of them the labouring force responsible for the maintenance of signs and signals, pavement markings, traffic counts, etc. Only 60 of these could be said to be in engineering categories, the remainder being sub-engineering categories. Of these 60, about 25 were college graduates or equivalent.

Parking Meters in New York

In New York there were 55,000 parking meters, mostly at the curb, and this made the Traffic Department self supporting. The total revenue was $7 million per annum. Most of the parking meters had charges of 10c. and were mostly for one hour, although some were for half an hour and some for as long as two hours. They also had a number of off-street parking lots in operation, usually 25c. for six hours and 50c. all day, but the price varied according to the demand in the locality. The total expense budget of the Department was $4½ million, including salaries, survey costs and maintenance control devices. This did not, however, include anything of a capital nature, which went into the capital budget and varied from $10 million to $15 million. This included off-street parking structures, signal equipment, etc.

Miscellaneous Notes

An especially interesting feature of the road called US1, near New York, is the 'jug handles' used to prevent left-hand turns. Anyone who wants to turn left starts by turning right, and turns a total of three right-angles before crossing the road.

Many people asked about M1, about the very high speeds on it and the high accident rate. I pointed out that M1 probably had the lowest personal-injury accident rate for roads in Britain, although

(*Concluded on page* 105)

J. J. LEEMING, B.Sc., M.I.C.E.

proposes a

NEW APPROACH TO ROAD ACCIDENTS

The County Surveyor for Dorset puts forward the thesis that neither stricter enforcement of the law nor severer penalties would be effective in preventing road accidents. He wants fuller knowledge and analysis of the causation factors and considers engineering rather than the motorist is often at fault.

WE do not really know the answer to the question 'Why do accidents happen'? but the usual one given is something such as 'The cause of accidents is speed!' or 'The cause of accidents is human error!' But while both these answers have a strong element of truth, the important question is whether they really offer a practical line of approach to stopping accidents. Speed is a fundamental basis of the life of the world. It can be a life-saver in many ways, and fast, flexible and economical transport has made our modern standard of life possible, so speed has its useful and beneficial side. The problem then becomes one of using it to the best advantage, and to the least disadvantage. Also, human error is inevitable. The road user is a human being, with all the failings which that term implies, and we have no means of making man perfect.

If, however, we make a new approach and decide that our object is stopping accidents and that the allocation of blame is irrelevant, we can look at the matter differently. The word 'cause' then becomes a source of confusion, and we should use another term. That of 'causation factor' is coming into use, though we may shorten it into 'factor'. This may be defined as 'a circumstance in connection with an accident which, if removed or substantially modified, would have eliminated the accident or changed its effects'. To illustrate this, we may consider a square cross-roads consisting of a minor road crossing a major one. Let us then imagine a motorist, A, crossing over the major road too fast, and being hit by another motorist, B, on the major road. Under the present dispensation in this country, A will probably be prosecuted for dangerous driving, and the matter will end there until the next similar accident occurs, when the whole process will be repeated.

Under the new approach, however, we will not allocate blame, but will look at the factors in the accident. The two main ones will be:—

(i) Error on the part of A, or B, or both,

(ii) the presence of the square cross-roads.

No one would dispute the first of these, but the second may need some comment. It has been known for many years that a square cross-roads leads to accidents, and it may be taken as fairly certain that if the cross-roads had been dealt with on modern lines, there would have been no accident. Thus factor (ii) is very definitely present if we are considering ways of stopping the accident.

Engineering

At first sight, this method of approach may seem to complicate the problem, but in fact our hopes of stopping accidents are increased because we now have more than one line of approach. These may be summarized as removing factor (i) by altering human nature so that the A's of this world do not make these mistakes, or by suitable works eliminate factor (ii), so reducing the chance of human error causing accidents. The decision we than have to make is which of the two approaches is the more hopeful of success. When considering this, we have the difficulty that the effect of Education and Enforcement,—the two E's to remove factor (i)—is impossible to measure. Any conclusion from them must inevitably depend on vague and general figures, capable of many interpretations, especially in the hands of those who are not trained in the use of statistics.

Engineering—the third E, which would eliminate factor (ii)—is much more promising as a line of research because small scale studies may be made, with limited objectives and under control, so that the validity of the conclusions from the studies may be established by reliable statistical methods. The usual approach is that of 'before-and-after' studies. In these, the accidents before and after a change is made in road conditions are compared with each other, and with those in a suitable control such as the whole country, or a county. A large number of such studies have now been made, and some conclusions can be reached. Some of the results are set out in the attached table, which is based on a similar one in a paper

presented to the Public Works and Municipal Services Congress in 1956 by Garwood and Tanner, of the staff of the Road Research Laboratory. Later material, very kindly supplied by the Director of Road Research, has been added to bring it up to date, and some results from similar studies made in Dorset have been added. The latter have been amended with fresh material since the table was presented to the Road Safety Committee of the Dorset County Council in February, 1960.

It will be seen that works have largely reduced accidents. A very probable interpretation of these results is that the changes which have reduced accidents have done so by removing some element of deception in the road layout. This opinion is strengthened by the fact that the public seldom seems to realize that a place is an accident black spot unless some attention has been drawn to the accidents themselves. Public demand is much more usually for the removal of some so-called 'death trap' which has actually had a low accident record. In one such case, in the Author's experience, a meeting was held to demand an improvement at such a 'death trap' which had only had one accident in a number of years. When the attention of the local people was drawn to a junction very near the place under discussion they said it was perfectly safe, and did not want it improved. Yet it had had quite a large number of accidents. One of these places looked dangerous, but had not had any accidents, the other looked safe, but may have many accidents.

Similar instances occur in the groups of improvements shown in the table, under the Dorset results, notably in lines 1e, 1g and 3a. An instructive lesson may be taken from the series of curves included in line 1e. For obvious reasons some of the circumstances have been altered to prevent identification of the actual place, though it is typical, and all the circumstances are true. A stretch of road had been resurfaced with a material thought to have good non-skid properties. It was on a busy road, but had had few accidents. Shortly after the resurfacing, accidents started on a bend where there had been none before, The drivers said they had skidded, but they were

Type of Change	*% change in accidents Garwood and Tanner's results Revised to 1960*	*Dorset results, revised to 1st April, 1960*		
		% change in accidents	*Number of places*	*Remarks*
Group 1. Changes which have most probably reduced accidents				
(*a*) Improved alignment at bends	−80			
(*b*) Roundabouts	−60			
(*c*) Staggering of cross-roads	−85	−37	7	Results variable. Some −100%
(*d*) Reconstruction of bridges and culverts ...	−70			
(*e*) Surface dressing sharp bends (all accidents)	—	−75	9	Results consistent
(*f*) Improvement of slippery roads (wet road accidents)	−80	—	—	
(*g*) Reconstruction of lengths of road on new line	−95	−36	20	Results fairly consistent
(*h*) Construction of dual carriageway	−30	—	—	
(*j*) Partial improvements	—	−45	15	Results variable
(*k*) Improved visibility at junctions	−30	Included in 1(*j*) above		
(*l*) Halt signs (mainly urban areas)	−80	—	—	
(*m*) Installation of traffic signals	−40	See below, Group 2(*c*)		
(*n*) 40 m.p.h. speed limit on unrestricted roads	−20	—	—	
Group 2c. Changes which appear to have reduced accidents				
(*a*) Imposition of 30 m.p.h. speed limit in fringe areas	−10	See below Group 3(*d*)		
(*b*) One-way traffic systems	−40	—	—	
(*c*) Installation of traffic signals	Gp. 1(*m*) above	−50	5	Results very variable
(*d*) Improved visibility at bends	−65	Included in Group 1(*j*) above		
(*e*) Superelevation at bends	−60	—	—	
Group 3. Changes which appear to have increased accidents				
(*a*) Reconstruction of road on same line, or resurfacing other than slippery roads in rural areas	up to +100	—		
(*b*) Squaring of right-hand splay junctions mostly rural, non-pedestrian accidents	+90	—		
(*c*) Removal of speed limits in fringe areas ...	+45	—		
(*d*) Double white lines	—	+20	19 miles	Results consistent
Group 4. Changes giving inconclusive results or producing no change in accidents				
(*a*) Installation of Halt signs (rural areas) ...	—	doubtful	9	
(*b*) Removal of Halt Signs (rural areas) ...	—	,,	3	
(*c*) Installation of slow signs	—	,,	19	
(*d*) Imposition of 30 m.p.h. speed limits in fringe areas	Gp. 2(*a*) above	0	16	Results variable

prosecuted and fined. Very properly, owing to the proceedings, the details of the accidents were not released at once. When full information about the first two or three accidents was received, the Author examined the surface with care. He thought it might have polished, and had it surface dressed, but left the rest of the stretch unchanged. The accidents stopped as abruptly as they had started and the untouched section continued to be accident free. It is obvious that the general judgment of the bend by motorists was sound, apart from the failure to realize the polishing of the surface, which it is surely unreasonable to expect the ordinary motorist to realize.

This curve is typical of a number of such curves included in line 1e of the table, though in some of these skidding had not been reported, and the dressing was done as an experiment. In this group, moreover, all the results were consistent among themselves. In all cases accidents were substantially reduced. The probability of getting such a result by chance is remote.

In the space available here it is not possible to give any further details of the reasoning which has led the Author to the opinion that an element of deception in the road layout is a factor in many more accidents than is generally realized, but the evidence is extensive, and comes from many countries. Some of the work which has stopped or reduced accidents is so strikingly trivial, even such things as the alteration in the position of a bollard, or of a lamp, that it is very hard indeed to doubt the presence of the deception. This does not mean that drivers' error is absent, merely that the deception is a factor, and that its removal eliminates the accident. In many of these cases it is much easier and cheaper to remove the deception than to try to make all men virtually infallible.

It must be admitted that the evidence is not conclusive, and the Author would not be so rash as to make the claim that his theory is conclusively proved but the conclusion is strongly indicated, and it should be studied much further. If it stands the test of study it will have some very important effects on our methods of accident prevention. Some of the possible effects are considered in the rest of this article.

Education

An enormous volume of propaganda is put out on road safety. It could almost be said that there is hardly any other subject given so much publicity, but no one asks the question 'What kind of propaganda is good?' Unfortunately it is taken for granted that all is good, yet a high proportion of it consists of accusation, even of abuse, of the motorist, and lays the blame for all accidents on him. Really constructive propaganda, such as the Highway Code, or that put out by the Royal Society for the Prevention of Accidents, is swamped under the weight of this chorus of accusation and blame of the motorist.

Propaganda of this sort is of the harmful type which the Author has called 'Leave it to Bill' propaganda. This type turns, as it were, to one type of road user and says 'It's alright, old chap, don't you bother to take care, that's not your job. Leave it to Bill, it's his job.' Now obviously anything which maintains that all accidents are the sole responsibility of the motorist, that he is the only one who need take care, must have a clear implication that no one else need take care, and naturally, being human, they will not do so. As an instance of this attitude, it is often said that if a pedestrian runs out from behind a parked car, the blame for any accident is with the man who parked the car and the motorist who hits the pedestrian. This is a clear implication that the pedestrian need not take care.

In contrast to this, the new attitude would be that both the parking of the car, and error on the part of the pedestrian—possibly also on the part of the motorist, were factors in the accident. If the car, had not been parked, and the others had taken more care, the accident would not have happened. All this behaviour contributed to the accident. This merely states fact. The allocation of blame is irrelevant.

It is even possible that this 'Leave it to Bill' propaganda has affected motorists since they have all used the road before they drove a motor. If they have first been taught that their safety depends on others, they may take this attitude with them to the wheel of a car. This is admittedly only conjecture, but it is quite possible, and is an aspect of the matter which should be borne in mind by those who put out road safety propaganda.

Enforcement

The Lords debates* on road safety on June 10, 1959 and May 4, 1960 show very clearly that the enforcement of the law is thought to be the main, if not the only, means of accident prevention. But engineers are fully entitled, even bound, to ask what evidence is put forward in support of this theory. The only answer which can be given to this is 'None at all'. Again it has been taken for granted, and rests purely on the *obiter dicta* of eminent men, mostly lawyers, and on the vague, general, feeling that people can be prevented from doing things of which someone disapproves by passing a law against it. There is little historical evidence for this, and, indeed, much to the contrary. Lawyers have many times made blood-curdling prophecies of the dreadful results which would follow from the relaxation of severe penalties, and they have been consistently wrong.

On the other hand, there are a number of indications which tell against the theory. They cannot be called by any stronger term, but they all point the same way, which strengthens the case against the law. The first of these is the fact that the law, by concentrating wholly on the motorist, is the most powerful source of 'Leave it to Bill' propaganda. By this concentration it implies that no one else need take any care, and that the conduct of other road users cannot contribute to accidents.

Then, if it is true that an element of deception in the road layout enters into many accidents, no law enforcement can be effective in stopping such accidents, since obviously no penalty will stop people from being deceived. This is an involuntary act, and penalties can only be a deterrent against wilful and deliberate acts. There is even the possibility that the law may even be itself acting as an active causation factor in accidents. This is illustrated by the curve mentioned ealier. Here, the prosecution of motorists prevented the full circumstances of the accidents reaching the highway authority in time for

action to be taken to prevent other accidents, accidents which could only have been prevented by engineering means.

The same effect may take place in another way. As a result of the powerful propaganda, backed as it is by some of the most eminent men in the land, public opinion seems perfectly happy that as long as enough motorists are punished, all is being done in the way of accident prevention that need be done. Thus little pressure is exerted on the Government to apply money to stopping accidents, even though it is so obvious that the accidents go on in spite of the prosecutions, and in spite of the fact that few doubt that the engineer could do much more to stop accidents if he was allowed to do so. Thus the Law is acting as a powerful brake on accident prevention by engineering means. Lord Elton's description of such measures as fringe measures was perfectly right, but only because they have been tried on such a minute scale, not because they are not effective.

Yet again, after an accident has taken place, the police inquire into it and their instructions are to find out if a legal case can be made out for the prosecution of the motorist, and the motorist only. On the railways, the corresponding inquiry is held by a qualified inspector, whose instructions are to find out how similar accidents can be prevented in the future. The contrast is fundamental. In one case, the object of the inquiry is the punishment of the motorist, in the other it is the prevention of accidents. The first result of this is that the evidence gathered by the police is inevitably biased, and useless for the engineer in his attempts to find out how to stop accidents. The motorist, being human, is trying to exculpate himself. Others are trying to incriminate him, owing to the prevalent opinion that the punishment of motorists is the solution for the accident problem. Thus the evidence becomes largely *suppressio veri et suggestio falsi*, and the discovery of the truth about the accident becomes very difficult. Engineering studies show that far more could be done to stop accidents if we could find out the full facts about them. Yet we traffic engineers cannot get this full knowledge at present. We grope in the dark, trying all sorts of hunches, while it is quite possible that if we were allowed to question the participants in the accident we might get the vital clue to enable us to stop them in the future.

Social Effect of the Law

The possible social effects of the law have some relevance to the subject, and they strengthen the case for the most careful study of its effects.

As will be seen from the Lords debate, the remedy proposed by the advocates of the present method is the imposition of more, and more severe, penalties on the motorist. If this fails—and if the thesis of this present article is correct it certainly will fail—then these people are likely to demand yet more penalties. This has actually happened, since each act passed has increased the penalties, and created yet more offences. Then if this fails yet again, then more penalties will be demanded, and so on until we find ourselves in the full fascist state. This is not in any way fanciful. The abolition of trial by jury for motorists—and no one else—has several times been proposed, even in the first Lords debate. The death penalty for motorists 'concerned' in a fatal accident has also been proposed. Such things, put forward by responsible and eminent men, are surely significant pointers. Trial by jury is almost the most fundamental of the liberties we have fought many wars and sacrificed many lives to preserve. Surely it ought to be unthinkable that we should risk losing these liberties on the off-chance—for it is no more—that we might save a few lives in road accidents.

Here, then, is a serious risk in our present methods, but there is another in which it may be doing grave social harm. The law bears very unevenly on the motorist, when compared with other sections of the community. He may be severely punished for some action while others doing a similar or analogous action not involving a motor vehicle are lightly punished, or even not punished at all. For instance, a motorist was imprisoned for reckless conduct, even though no accident had resulted, while at about the same time a train driver, said by the Ministry Inspector to have been guilty of gross recklessness, was not even prosecuted, although his conduct had resulted in deaths and injuries. Under the Road Traffic Acts, a penalty of up to five years imprisonment may be imposed on motorists for reckless conduct involving a death, yet such a penalty is not imposed on anyone else. This was enacted in 1956 openly and avowedly because of the notorious difficulty in getting convictions for manslaughter, yet although the same difficulty applies to all such prosecutions, only the motorist has had this discrimination against him. Again, if a motorist and a pedestrian are involved in an accident to which the conduct of both has contributed, only the motorist will be prosecuted.

One result of this may be the contempt for the law which is becoming so obvious, and so disturbing. Such regulations as the speed limit and the 'Halt' sign are treated with complete contempt. This has been many times confirmed by observations of traffic in traffic studies. Yet the people treating the law with this contempt are just that section of the community which would ordinarily be expected to be the most law-abiding. It is this which is so disturbing, and which is such an obvious social danger.

The Problem Restated

The argument so far has thrown some doubt on the effectiveness of the two E's of Education and Enforcement as preventatives of accidents, and shown that they may even be doing social harm, and acting as a causation factor in accidents. Admittedly, the arguments are not decisive, but they have a cumulative effect, especially in view of the complete absence of any evidence in favour of the present system, and in spite of its long period of use. Thus it is essential that our present methods should be re-examined with the greatest possible care.

There are also certain other questions we must ask. Why do respectable and law-abiding citizens, otherwise models of behaviour, treat one single section of the law with complete contempt? We do not know the answer, but the uncomfortable possibility exists that they do so because the law is worthy of contempt. Then, why do normal, intelligent people, holding

responsible positions in the life of the community, make apparently silly mistakes and have accidents? We see that they do, and cannot account for it. Is it possible that we are asking too much of the human machine, and then punishing it for its failure? The possibility further exists that this failure is due to our own negligence as a community.

The answers to these questions are vital to any solution to the problem, indeed, they are really the problem itself, yet under the present dispensation we have no means of arriving at an answer.

First Step to a Remedy

It is not yet possible to propose a remedy, we do not know enough about the problem, but our approach to finding one must be subject to two conditions. It must have as its first and only object the prevention of accidents. The second must be that we must get the fullest possible information on which to base a proposal for a remedy. This information must be gathered impartially and in a scientific spirit, and its gathering must be under the control of qualified traffic engineers and statisticians. We must thus first of all copy the railways and make our inquiry into accidents a source of information and study, and we must have the full co-operation of all road users.

The first step, then, must be to eliminate the present primary object of punishing motorists. To this end, we must take the investigation into accidents out of the hands of the police, and transfer it to a traffic corps, which must be under the control of the highway authority.

Only thus shall we be able to fulfil the necessary conditions. In the meanwhile, while the traffic corps is being formed and carrying out its studies, we can extend our present well-tried engineering methods, and eliminate well-known accident black spots. In other words, we must start stopping accidents. This will naturally involve the spending of money, but we know full well that, quite apart from the question of accidents, something of the sort must be done soon unless we are to strangle the whole economy of the country by traffic congestion. Fortunately, the elimination of traffic congestion and accidents are very closely related, and the money spent would be returned in full measure by savings in other directions. We must ask ourselves, 'Are we punishing motorists to save accidents, or to save money?' We are really doing it with the idea that it saves money, yet in fact it wastes it.

Reform of the Law

The proposed change will undoubtedly mean a drastic reform of the law. It would first mean reducing drastically the number of offences a motorist can commit. Among these would have to be that of careless driving, at least in the very many cases where it is clearly nothing more than error of judgment.

These proposals will arouse the utmost opposition on the part of the 'lambast the motorist' school. But when one looks at the matter objectively, what earthly use are the majority of prosecutions? For instance, the prosecutions of the motorist on the curve mentioned in the section headed 'Engineering' could have gone on till the cows came home without stopping the accidents, which could only be done by engineering means. The prosecutions prevented these means being taken soon enough, and so were actively harmful. They only served the purpose of revenge.

This is not to say that there should not be any prosecutions at all. There will always be a hard core of people who will be wilfully careless and selfish, just as we see that there are similar people who cause other types of accident. These can only be dealt with by legal means. But if we do this to motorists, we should in justice include other people who do analogous things with other types of weapon. We must, therefore, consider the question 'Is it, or is it not, a crime to kill or injure another person, or damage his property, by carelessness, negligence, or error of judgment?' If we decide that it is, then anyone who does it should be punished. If we decide that it is not, then no one should be punished, not even the motorist. The present situation, in which one man may go scot free after causing the deaths of many people by what appeared to be gross recklessness, while another can be severely punished for merely looking as if he might injure someone, surely offends against the most fundamental principle of law, that it should be impartial, and that all men should be equal before it.

There is another need for the reform of our law, in that it is based solely on hunch, and on no real investigation. Someone influential has said 'So-and-so must cause many accidents, make it illegal', and illegal it has been made, without the smallest attempt having been made to find out whether it really does cause accidents.

The law is even contradictory. Many people believe that the dawdling driver is a menace on the road. Lord Lucas called him the 'road tortoise'. The Author frankly admits that he does not know whether this is so, and does not think anyone else does either. Yet the dawdler does cause intense irritation to others, and is often behaving inconsiderately—itself illegal—so the idea may have some foundation in fact. Yet the law compels—or tries to compel—many people to dawdle, by reason of the 30 m.p.h. speed limit on commercial vehicles. In the case of the cross-roads considered in the opening section of this article, in this country A would have been considered the guilty party, yet in others B would have been. Which is right? We don't know. We ought to try and find out.

The Police

The proposal that the inquiry into accidents should be taken away from the police is most certainly not intended as a reflection on them. They have carried out a thankless and unpleasant task with great wisdom and forbearance, for which no praise can be too high. But the police are the first sufferers from bad law, and the present bad highway law has undoubtedly had a marked effect in damaging the former good relations between the police and the citizen. Human nature being what it is, people blame the people who apply the irritant, rather than the irritant itself. Now the law is in many ways intensely irritating to motorists, and in many cases there is no apparent reason for them to be subjected to the irritation, which makes them think that the police, who are after all only carrying out their duty, are persecuting motorists for

the sake of persecution. Yet the police can hardly help themselves. To take one example, the very nature of the speed limit makes it inevitable that the only places in which it can be enforced are just those places where it is not dangerous to exceed it.

Then the whole matter is one of traffic engineering, and the police are not trained as traffic engineers. This discipline is becoming one of great complexity, demanding a standard of knowledge of mathematics, of statistical methods, of road construction and so on, far beyond the training of a policeman, and even involving some degree of specialization for trained and qualified engineers. This has been recognized by the Institutions of Civil and of Highway Engineers, who are considering examinations for Diplomas in Traffic Engineering, to be entered for by engineers already qualified. Traffic duties, moreover, are taking the police away from their main functions of the detection of crime, and involving them in the preparation of a mass of information, much of it quite useless. On these counts there is some case for relieving the police of these duties, and the Author can only repeat that no reflection of any sort on them is intended.

REFERENCE

*Parliamentary Debates (Hansard). House of Lords Official Report. Vol. 216, No. 81. June 10, 1959 and Vol. 223, No. 75. May 4, 1960.

Conclusion

The proposal put forward here is revolutionary in that, for almost the first time, it casts doubt both on the value of the law for accident prevention, and on its fundamental justice. There are those who will be outraged by the whole suggestion. To them he can only suggest that they carefully and anxiously examine their consciences to see how far their opinions are based on prejudice. It is tragic that much prejudice has entered into this matter. To others he suggests that careful consideration should be given to the proposal. It is not claimed that full proof of the conclusions has been given. Yet they are based on a practical study of the subject going back over twenty years, to the pioneer studies of the late Lt.-Col. G. T. Bennett, to whom the Author must acknowledge his indebtedness.

Finally, may we not ask whether the fundamental solution of the problem does not rest on good manners, and the practical application of the Christian virtue of charity? If *all* road users—the operative word is *all*—behaved with the full spirit of charity one towards another, there would be very many fewer accidents, but surely the law should be the first to set the example. Abuse and persecution are themselves a failure in charity, and bad psychology as well, for those who are treated as criminals tend to behave as such.

Visit to the United States

(*Concluded from page* 99).

some speeds were, I thought, too high. But it was clear that the erroneous impression existing in Great Britain about this road had been widely copied in the U.S.A.

The Americans make great use of reflectorized paint but seldom use catseyes. Reflectorized paint is certainly attractive in good dry weather but can disappear when flooded with water.

An interesting feature of some U.S. towns is the very high capacity parking grounds on their outskirts. I saw one on the outskirts of New York capable of holding 1,100 cars, to or from which buses travelled every five minutes to the town centre during the rush hours.

Although there is talk about possible cuts in the $2,000 million annual road construction programme, the programme is continuing.

I attended a meeting in Princetown, at which the Commissioner of the Bureau of Public Roads stated that recent investigations by the U.S. Department of Agriculture indicated that the farms served by gravel roads sell for 3-11 per cent more than similar properties served by dirt roads; for paved roads the figure was 32 per cent. He said that other studies were said to have indicated that the price differentials may run from 38-78 per cent in favour of better roads. Expressways and throughways were said to give much greater mobility and wider job opportunities to most of the labour force. The famous New York Thruway had attracted $650 million worth of industrial, commercial and residential development along its 538 mile route. Reference was made to an area close to California's East Shore Freeway which covered only 9 per cent of the total industrial acreage in one county but had attracted over 40 per cent of the dollars invested in the new industries in that county. Some land values had gone up by 500-700 per cent after the building of the Gulf Freeway and the Dallas Expressway. The Flint by-pass was said to have saved motorists about 30 minutes and generated a better than 30 per cent increase in the vehicle miles travelled in the Flint area while traffic accidents were sharply reduced. The new Olympia freeway in Washington had reduced through travel across the city from 25 minutes by the old route to seven minutes by the new freeway.

Acknowledgments

The writer is deeply indebted to the many people in the United States who were willing to spend time and trouble in giving him knowledge and information. He wishes to express his gratitude to all of them. The paper is published by permission of the Director of Road Research.

NEXT MONTH'S CONTRIBUTORS include

Christopher Brunner
Road and Traffic Economics

Edmond Goelen
Belgium's Road Design Standards

J. L. Beckett
Leicester's Parking Plans

ROAD SAFETY

TRAFFIC ENGINEER'S CONTRIBUTION

by Brigadier R. F. E. Stoney, C.B.E.

Director-General, The Royal Society for the Prevention of Accidents

HERE at the start of the 1960's, all of us at RoSPA, and indeed all workers in the road safety movement throughout the country, can sense at long last a gratifying change taking place in public opinion towards the problem of road accidents. It is reflected in far greater space being allotted to road safety comment and advice by the press, both technical and lay, by television and radio, and by commercial firms in their prestige advertising. From the debates and questions in both Houses of Parliament, from recent pronouncements by the Magistrates' Association, the British Medical Association, and other important professional bodies with a right, and, therefore, a duty to speak on the problem, it is obvious that apathy towards road safety is a thing of the past, and that the public is now conditioned more than ever before not only to the need for remedies but also to pay the necessary price in terms of cash or curtailment of individual freedom.

Into this age of awakened awareness, of public goodwill towards the solution of the road accident problem, steps this young science of traffic engineering. It has to meet a two-fold challenge: to get our traffic moving, and to make our roads safe. These aims are of course inter-related in precisely the same way that, in manufacturing industry, all progressive managements have come to realize that safety and production are partners, and that the safe way to work is the only efficient way and the only economic way to produce. Indeed, there is a close parallel between the traffic engineer and the production engineer, as both must incorporate safety at the drawing board stage, mistakes being cheaper to correct with an india rubber than a concrete-breaker.

Wanted, a Fool-proof Scheme

Naturally, we in RoSPA have a particular interest in the way the traffic engineer tackles the safety aspect of his work. No-one appreciates more than those whose work is one of educating the road-user in how to avoid creating an accident-producing situation, the need for a safe environment. It is true that a tight-rope walker in his fundamentally unsafe medium so seldom has an accident that he can even insure his life on favourable terms, but he is trained, he concentrates, and he is mentally and physically fit. If all the ten million driving licence holders in this country were half as well trained, alert and fit, the traffic engineer might well regard in-built safety in his designs somewhat of a luxury; but, since these ten million, representing as they do one in three of the whole of our country's population between the ages of 16 and 70, must inevitably include quite a proportion of untrained, couldn't care less, day-dreaming morons, the traffic engineer has indeed a responsibility to ensure that the end-product of his schemes is, quite literally, fool-proof.

The traffic engineer must deal with the problem of *urban* roads if he is really anxious to help stop accidents most effectively. For 60 per cent of all road deaths, and over 70 per cent of all road casualties are incurred in built-up areas. However much new motorways and improvements to existing trunk roads are a pressing economic necessity —and I would certainly not belittle the safety dividends accruing from such activity—the fact remains that the most fruitful field in which the traffic engineer can best further the cause of safety lies in our towns and cities. And surely the need to attack accidents is not the sole justification for emphasizing the importance of urban systems for the traffic engineer's consideration?

Is not the nation's traffic getting more bogged down due to urban congestion—lack of parking and off-loading facilities, half-hearted circulation systems, ill-sited street furniture, absence of lane markings, etc.—than ever it is on account of the deficiencies of our rural road network? I am, too, a trifle sceptical of the estimates of the traffic problem in, say, 1970 which frequently seem based on the adding together of the estimated output of vehicles from the Big Five into the home market and superimposing this figure on to the 8½ million odd vehicles already on our roads. Surely, long before then, we shall have had legislation, or at least shall have sufficiently enforced existing legislation, to ensure that older vehicles with poor performance are pensioned off and, with probably more weeding-out effect, that potentially unsafe drivers no longer swell the licence holding ranks?

Furthermore, much of the car traffic on our roads to-day are firm's cars, not privately owned at all and are we really to expect a vast expansion in the fleets of firms? Even if I am wrong in feeling that the outlet for the motor industry's wares in the home market is likely to be along the lines of more vehicles per licence holder rather than an expansion in numbers of both licence holders and vehicles on a one-for-one basis, there are already signs that private car owners are no longer so anxious to go 'motoring for pleasure' at Bank Holidays. All this suggests to me that it is indeed the urban streets problem that must be a priority target for the traffic engineer.

Remember the Pedestrian

I would make one final plea. Any competent engineer can design a limited access highway on which there can be no conflict between driver, cyclist or pedestrian simply because the two latter are not there. The traffic engineer worth his salt, however, will design for safe traffic flow without inconveniencing the non-driving population whose rights to consideration can so easily be overlooked when one is searching for a machine age solution. In the country, the needs of walker and cyclist are all too often forgotten and they are left to take their chance in the traffic maelstrom assisted only by exhortations from the Highway Code to walk on the right of the road to face oncoming traffic, and to ride in single file when road and traffic conditions require it. The traffic engineer designing from scratch should do better than that. But it is in the urban areas that the traffic engineer can really show his skill. Ideally, we all know that shopping areas should be free of all wheeled traffic and that all off-loading should be from bays at the rear of the shops. Shopping arcades set back at street level, or pedestrian walkways at first-floor level, have also been mooted, and no doubt many other ideas towards road-user segregation exist or will be thought of. All I would say is that the traffic engineer must make good provision for pedestrians to cross roads in shopping areas, particularly bearing in mind the old and the mother with her pram in his designs for the crossings. In this classic conflict of interests between driver and pedestrian, both must obviously give up some personal freedom of action. In thinking of ways to approach the problem, it is salutory to remember that the penalty in 1960 for a pedestrian who fails to comply with the Highway Code is frequently the same as for murdering a policeman—Death. As for the unfortunate cyclist in urban areas, one of the most ingenious traps for his downfall is the carriage way marking by means of steelplates, now outmoded, but many alas still in existence.

PROFILE . . .

of a

TRAFFIC ENGINEER

Sir HERBERT MANZONI, C.B.E.

WHILE personal success still has today something of a fairy-tale flavour, the success of an enterprise more often raises the very practical question: How was it done? This is so with the spectacular re-development plan of the city of Birmingham. How, it is asked, was Birmingham able some 15 years ago to set in motion a scheme affecting more than two and a half square miles, together with the re-organization of its entire central traffic, when the next similar scheme in size in the whole country was only for something like a hundred acres? How has approval been obtained? Why has there been relatively little difficulty in the mazes of Town and Country Planning acts?

To Sir Herbert Manzoni, who, as City Engineer and Surveyor, has inevitably come to be something of a figure-head for the scheme, there is no mystery. Nor, he claims, have there been any accidental factors of importance. Birmingham, he points out, is the second largest city in Great Britain; its modern history is one of industrial achievement and enterprise. Birmingham was quite simply early in the field. Already before the war, it had begun to put its house in order, tackling its slum problem with boldness, starting to build a fine Civic Centre. When, even before the end of the war, there was legislation for the reconstruction of bombed areas, Birmingham was ready, its pre-war plan modified in the light of new lessons. Its City Engineer and Surveyor was a member of the small committee hammering out the provisions of the act of 1944, which came to be known to initiates as 'The Blitz and Blight Act'; and the one claim Sir Herbert makes for his own participation is his insistance at the time that 'blight' was as important as 'blitz', that the opportunity must not be lost for sweeping away the causes of suffering and inadequacy in old areas, either dwellings or commercial premises. So Birmingham got its scheme approved before 'The Blitz and Blight Act' became merged in the intricacies of the more complicated Town and Country Planning Act of 1947.

No mystery. No accident. And these words might be a text for Sir Herbert's own career. He chose it, and even, in a measure, chose the field in which he was to pursue it, for reasons about which he was considerably more articulate than the average young man. His father was the sculptor, Giovanni Manzoni, an Italian who had left his native Milan simply because Italy was a poor country and Britain a rich one. He married an English girl and settled in Birkenhead, where, in 1899, Herbert was born and where he grew up, in the artistic environment of his father's work and interests. Sympathetic to these, he was yet afraid of them, seeing clearly the liabilities of the artistic temperament. He decided that a scientific training was the necessary counter-poise, and with a streak of practicality, chose Civil Engineering, qualifying at Liverpool University. He determined, too, as soon as possible, to try for an official position in one of the large provincial cities. He saw these as offering scope and satisfaction not to be found, of course, in a smaller place, and not in London either; for a county borough, with its co-ordination, is a single authority, not hampered by the division of responsibility which today so damagingly increases London's difficulties, especially its traffic problem. He got to Birmingham in 1923, and rose successively to become its Chief Engineer and Surveyor in 1935. Many honours have ensued, culminating in knighthood in 1954 and in this year's Presidency of the Institution of Civil Engineers. He is also a registered architect, and has just completed a term as Chairman of the Building Research Board of the Department of Scientific and Industrial Research.

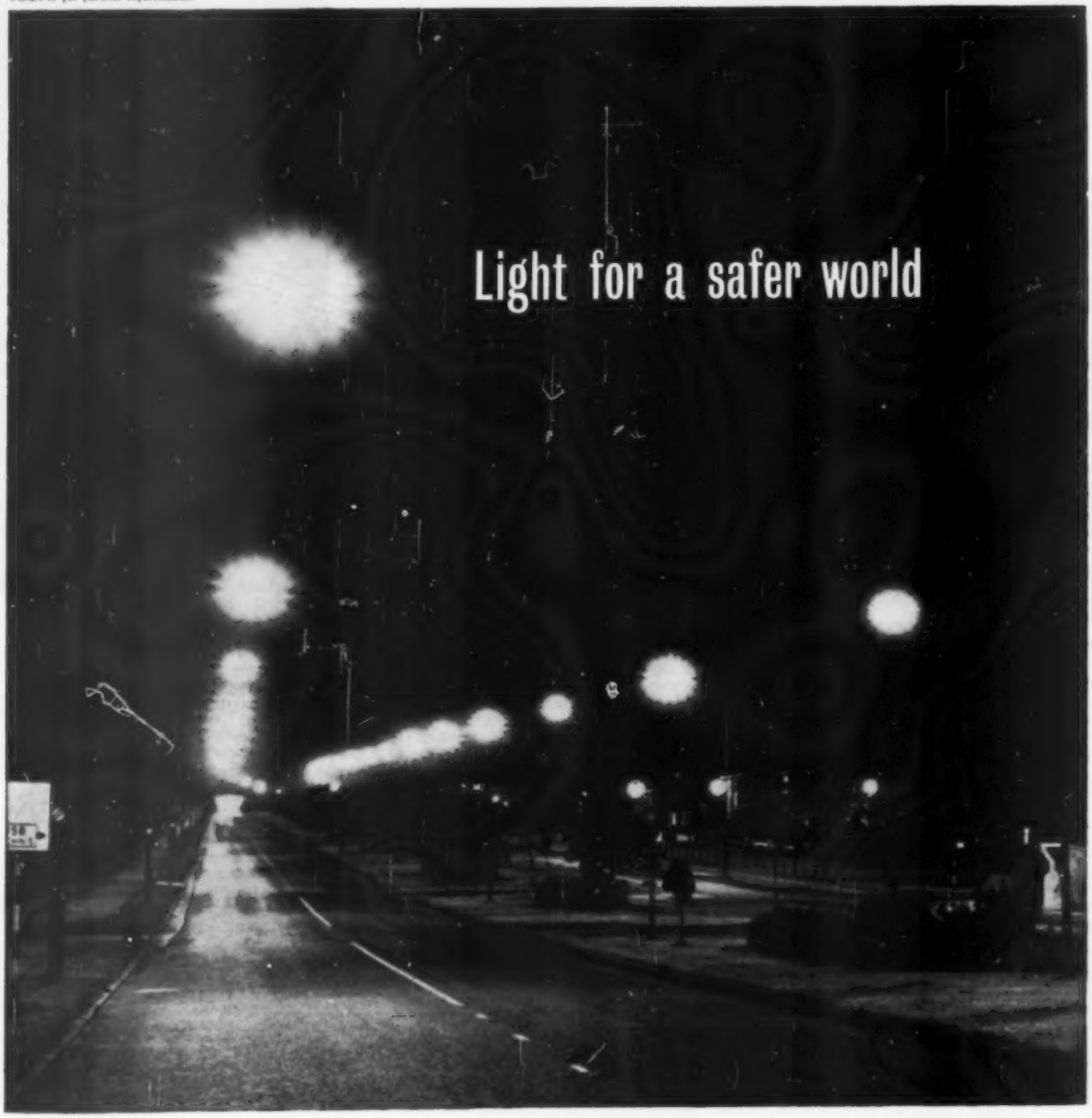
The balance between Science and the Arts is a passionate conviction with Herbert Manzoni, and he goes further than many people in advocating that both be retained in advanced education, and in deploring too early specialization, even if this must result in a longer period of study. He believes nothing has really ever bettered the humanities for inculcating breadth of view, and he sees as catastrophic, in face of the complexities of the future, the possible division, not only of this country, but of the whole civilized world, into two opposite academic camps.

It follows that education of the public in public matters is another thing he presses warmly. Get people interested in the right things, get them traffic-minded, for instance, as in the United States. And to do it, get them talking about such things, enlist the good-will of the Press. But, above all, do something that speaks for itself. Put the goods in the shop window. It is the best answer to criticism.

Sir Herbert is frank about criticism. Of the re-development scheme, involving practically the creation of five new towns within Birmingham's central area, five new complete neighbourhood units, and the building of an Inner Ring Road to supplement the famous 'cog-wheel' one-way traffic—the first such comprehensive system in the country, though, in 1936, when it was imposed, intended only as a temporary palliative—the principal criticism has been architectural. Architects always criticise architecture, says Sir Herbert, who grew up with artists. Sir Herbert—and Birmingham—can afford to let the enterprise be its own defending counsel. Experts and students have come from all over the world to see the work in progress, the work that to the lay people of Birmingham is still so tantalizingly a matter of scaffolding and holes in the ground, but in the American press it has been called 'the biggest re-development show on earth'.

Sir Herbert is the first to insist that

(*Concluded on page* 111)



With road safety a major consideration, this ¾-mile stretch on the main Glasgow-Edinburgh road is now lit by 52 high wattage Sodium lamps developed by Philips Electrical Ltd. The new system was largely the inspiration of Mr. Denis Colvin, Street Lighting Engineer to the County of Lanark, who co-ordinated the activities of Philips on lamps and gear, the Engineering & Lighting Equipment Co. Ltd. in their development of the new ELECO Golden Ray '280', and of Messrs. Stewarts and Lloyds, who provided the special steel columns. In operation it is no longer possible for confusion of light sources to be an accident hazard and the reduction of the number of columns used reduces the number of possible collision points.

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LIGHTING OF TRAFFIC ROUTES

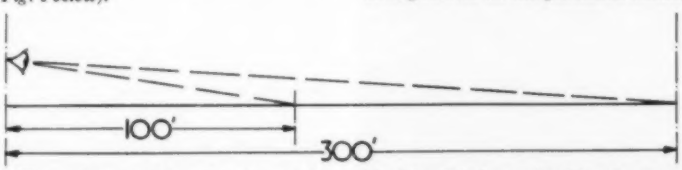
British and Continental practice

by H. Hewitt, A.M.I.E.E., F.I.E.S.
(Atlas Lighting Limited)

THE ever-present topic of road safety attracts the attention of many professions—the municipal engineer, the civil engineer, the automobile engineer; and amongst other interested parties is the lighting engineer, who feels that he too can make a real contribution to traffic engineering and help significantly to reduce the road accident rate. Although it is difficult to establish statistically, there is no doubt that good street lighting helps to reduce the accident rate on roads. At the International Lighting Congress in Brussels last year it was agreed that statistical returns must be very considerable to be reliable, but the general opinion was that modern street lighting on traffic routes can reduce personal accidents after dark by as much as 30 per cent. This then is not in dispute; what may be disputed, however, is the definition of good street lighting.

A few years ago Britain was supreme in the setting of street lighting standards, and it is probably true that our general level of street lighting, particularly on main roads, is even now higher than in any other country. In new installations, however, we are being challenged by different ideas which are emerging, particularly in Continental countries. At the Brussels Conference last year delegates had the opportunity to examine two different methods of lighting a main road. One, the 'Anglo Saxon principle', relied upon silhouette vision, employing the techniques which have become well-known in this country over the last twenty years. The other, the 'Continental system', employed closer spacing of lamps and the severe cut-off system which has never been greatly favoured in this country, but which is now being employed on the Continent in very ambitious installations. It is the intention of this short article to review some of the factors involved in this controversial issue, as applied to the lighting of traffic routes.

In street lighting economics has always been the dominating factor, and because of this it has been necessary to try to 'make a little light go a long way'. The British silhouette principle has been extremely successful in accomplishing this. Briefly, the technique requires that objects shall be seen by being presented to the eye as silhouettes against a relatively light background, i.e. the lighted road surface. Taking into consideration the normal sight-line of the motorist and the speed and braking power of the average car, the driver is usually concerned with objects lying between 100 to 300 feet ahead. (*See Fig. 1 below*).



To make an object in this region appear in silhouette it is necessary to make the road surface beyond the object appear bright as seen from the direction of the on-coming car. To do this economically, advantage is taken of the fact that the reflectivity of a road surface increases as the angle of incidence becomes greater, and the most useful light, therefore, is that which reaches the roadway at a grazing angle and is reflected towards the motorist.

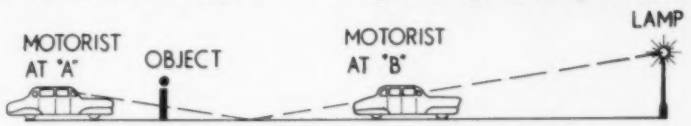


Fig. 2 above, shows in an idealized way the employment of this principle to reveal an object some distance ahead of a motorist at point A. At this particular moment his vision is being assisted by a lamp some considerable distance ahead, and it will be seen that when eventually the motorist reaches position B he is liable to suffer glare from the very lamp which previously assisted him, as the light from this lamp is deliberately directed to the road surface at an angle only just below the horizontal. Because of this, street lighting by the silhouette technique is always a compromise between high road brightness and glare from the source of light. Nevertheless, by the clever design of street lighting lanterns and by using ingenuity in the placing of columns (particularly on bends and at inter-sections) street lighting of high quality has been possible in this country. *Fig. 3* shows a road at Newmarket lighted by orthodox fluorescent lanterns, and it will be seen that visual conditions on the road at night can be very good; in this case probably better than in good daylight, though this is because of the trees which line the road.

During an era in which restriction of public expenditure has been important, the silhouette principle has been of great value in this country. Its widespread adoption has had inevitable effects on the choice of lamps and the design of lanterns; for instance, the twin

requirements of low running costs and the minimizing of glare have been largely responsible for popularizing the efficient sodium vapour lamp for the lighting of traffic routes.

There are, however, some obvious disadvantages in the silhouette technique and no doubt some of our Continental friends would claim that our basic difficulty is that of providing enough light for modern road conditions without making glare problems insuperable. The development of the 200 watt sodium lamp in this country will no doubt be very welcome in raising the standard of street lighting installations planned along existing lines, but there are numerous installations in other countries which use considerably more light than is normally employed on main roads here. For instance, *Fig.* 4 shows the Champs Elysées in Paris, a road carrying traffic of high density at peak periods and which uses 70,000 lumens per 100 ft. of road—compared with 16,000 lumens per 100 ft. in Shaftesbury Avenue in London. No doubt the Champs Elysées has prestige claims to a particularly high standard of lighting, but there are other very ambitious installations on the Continent. A recent installation in Madrid has given an average illumination on the roadway of 5 lumens per sq. ft.; very high indeed by British standards. To see heavy traffic travelling quickly and confidently without headlights on roads like these makes us realize that the strain on the driver must be reduced; and the danger to the pedestrian decreased.

Whilst our lighting practice has not yet been generally influenced by these Continental trends, it is true that a number of high quality installations have been erected in this country, and to provide the necessary amount of light multi-lamp lanterns have sometimes been employed at increased mounting heights. The justification for these installations largely results from the fact that in heavy traffic conditions the road surface is often almost completely obscured and the silhouette principle then becomes largely ineffective. The artificial lighting must therefore provide means whereby pedestrians and vehicles are seen by reflection instead of by silhouette, but there is apparently some reluctance to admit that this means the adoption of the cut-off principle, in which light is directed at more vertical angles to the roadway, as this must necessarily involve closer spacings and possibly greater mounting heights. It can be demonstrated, however, that if economics permit such an installation the lighting will not only show up the pedestrian and the motor-car, but will also decrease considerably the possibility of glare. One classic objection to the cut-off principle has always been that the surrounding darkness creates an unpleasant 'tunnel effect'. Yet every theatre and every floodlit football ground exploits the surrounding darkness to concentrate the attention, and surely there is no place where concentrated attention is more necessary than on a main road.

Cut-off lighting is not of course new to this country. Certain towns and cities, e.g. Liverpool, have been devoted to this kind of system for many years and it is also significant that where glare conditions are a severe problem, e.g. at roundabouts and in the vicinity of airports, high-angle distribution is useless. Such conditions have produced the 'Aeroscreen' type of distribution, which can be regarded as a compromise between British and Continental ideas.

Whilst lighting authorities in this country must still be guided by the

Fig. 3. *A Newmarket road by night.* (*Photo: Atlas*)

Fig. 4. *Champs Elysées, Paris.*

present Code of Practice based on the silhouette principle, lantern designers are beginning to move towards the idea of greater light output, lower-angle distribution and possibly greater mounting heights. *Fig.* 5 *below* shows the Atlas Alpha 3 lantern, designed for 250 watt or 400 watt colour-corrected mercury lamps and having a peak distribution at 75 degrees.

The danger is that these newer ideas may find application only in the really ambitious installations, possibly in city centres and crowded shopping streets. In contrast, the Continental countries have been much more concerned about the whole problem of glare, and both France and Italy have even experimented with fluorescent lighting used with the major axis of the lantern parallel to the road; and we hear also of a mercury lantern in Germany designed with an adjustable cut-off to allow for variations in layout of the installation.

Throughout the whole of the history of the silhouette principle in this country—and a creditable history it has been—lighting engineers have always regretted their dependence upon the optical performance of the road surface, since this is essential to the efficiency of the installation. Obviously, however, many other factors must be taken into consideration as well as lighting when choosing the material and texture of a road surface, and the trend is now towards non-skid surfaces which are usually not conducive to lighting by the silhouette principle. This factor can influence the effectiveness of street lighting quite dramatically, and there is the additional difficulty that a road when wet exhibits a completely different picture from the same road when dry. Folcker of Stockholm has recently shown that this change can be so drastic as to reverse the whole process of seeing, even on roads lit to a high standard, a person being seen by reflected light in dry conditions but being seen merely as a dark silhouette against a bright roadway on a rainy night. Perhaps, therefore, one of the chief disadvantages of present-day street lighting practice is its dependence upon the texture and reflectivity of the road surface, and this becomes less and less important as we move towards the Continental system.

Whilst the main purpose of street lighting is obviously to provide good seeing conditions for road users, there are also other considerations which must be taken into account; considerations which often cause more public controversy than the functional purpose of an installation. Aesthetics are playing a more and more important part in everyday life and the colour rendering of street lighting installations, and the daylight appearance of columns and lanterns is rightly of concern to the general public. There is a very elegant installation in Denmark in which the slim fittings and well-designed columns have an excellent daylight appearance. Generally speaking, lantern design on the Continent is not particularly good from the appearance point of view, though we could learn much from Continental countries on the design of columns. These are not, however, factors which are of major importance in traffic engineering. The all-important thing is that road casualties should be reduced by every possible means. If lighting is to play its maximum part there must be a greater call on the public purse and perhaps a new look at lighting techniques; and if the choice is between street lighting which is efficient and street lighting which is elegant, then the decision is obvious. We must hope, however, that our engineers and designers can produce for us equipment which can not only perform its function efficiently, but which can also present a pleasing appearance to the eye.

Code of Practice for The Erection of Street Lighting Equipment. Association of Street Lighting Erection Contractors. 2s. 6d.

This booklet sets out to be a guide to good practice in the erection of street lighting equipment. Its scope is described as follows: 'This Code of Practice provides guidance on the materials to be used for street lighting installations, on the methods and precautions to be observed during erection, and it includes information on relevant British Standards, I.E.E. Regulations and Government Publications.' In fulfilling this objective the booklet covers the various stages from choice of materials to the final erection, wiring and marking. It is therefore comprehensive in scope and should prove useful as a supplement to more technical publications.

Profile

(*concluded from page* 107)

the achievement is Birmingham's. Years ago, as a 'junior', his work took him into slum areas, into the houses of the poor. Almost unconsciously the wish grew to do something. When, recently, he was asked whether this had not proved an important influence on the present project, he answered: 'Influence, no. Help, yes. The members of the City Council of all parties were obsessed with the same wishes. I was merely the person who was in a position to give a picture of the solution. That is what the expert is for.'

On another occasion, it was assumed that, since he had virtually been practising Traffic Engineering before the subject was recognized as such in this country, he must have been responsible for the establishment of a Chair in it at Birmingham University, especially as Sir Richard Nugent, then Joint Parliamentary Secretary for Transport, after investigating the position in the United States, discussed it with him and the then President of the Institution of Civil Engineers.

'Nonsense,' was the characteristic answer. 'Birmingham was the obvious place. The Imperial College, London, for reasons of its own, couldn't have it. Birmingham and Durham already had Chairs in Highway Engineering, and Birmingham is bigger.'

Herbert Manzoni is happy in having a wife who shares his interests—even to his love of fishing. His sympathy with people, however, suggests that he would not grudge her following pursuits quite different. He is glad that his younger son, a civil engineer, too, has that desired balance of scientific and artistic tastes, but he speaks no less affectionately and proudly of his elder son, whom he delights to help on his farm.

Exemplifying in himself, this theory of balance, he is a founder member of Birmingham's Crescent Theatre, the adventurous amateur group with productions of Ionesco, Brecht, Arthur Miller and the young British *avant-garde* to its credit, but—typical again—he does not tell you that he was one of those who advised on adapting its premises when it started.

'I do not have many hobbies,' he says. Not really surprising in someone who has written something like three professional papers a year in his spare time for the last thirty years. 'But what are hobbies?' he asks. 'Some people list reading as a hobby. But reading is part of life.'

And what, one wonders, does Herbert Manzoni not find part of life.

R.L.

Next Month's Profile

James Drake

Correspondence Welcomed

The Editor wishes to acknowledge with thanks the large number of congratulatory letters received following the first issue of TRAFFIC ENGINEERING & CONTROL as well as those commenting upon the substance of the articles published. Next month it is proposed to start a correspondence column and reader's opinions will be welcome, controversial or otherwise, but correspondents are requested to be reasonably brief.

Submissions Invited

Since one of the main purposes of TRAFFIC ENGINEERING & CONTROL is to publish the results of road and traffic studies and projects associated with them, the Editor invites the submission of news, information and papers thereon by those engaged in this field.

FOUR STOREY PARKING AT . . .

£200
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The K.F. Parking System allows nose-to-tail parking on three or four levels at the fantastically low cost of £200 per car space. Of Unit Construction in pre-stressed concrete, the K.F. system is ideally suited to any site, even for conversion of existing parks or buildings. Capacity increased four times. Cycle time less than 1 min. faster than any other system.

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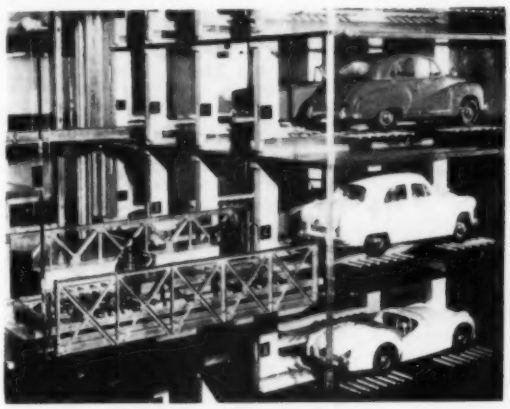
AUTOMATIC PARKING

IN recent months several systems have been developed to make the parking of cars a more convenient and simpler operation, by the use of mechanical aids. Basically most automatic systems are the same in that the conception of cars as packages is common to all. However, the handling of this package-vehicle varies considerably, and particulars of four different automatic methods of stacking of cars, which is a fair cross-section of such systems, are given here. No attempt has been made to include all the systems at present under construction or planned, nor to assess their respective merits. Each one has advantages and disadvantages according to the use, design and situation of the projected car park, and the merits of every system must be examined in relation to the site and the nature of the project concerned.



Parking by the Motopark system.

Motopark

A completely British design for mechanical parking is put forward by Land and General Developments in the form of a Motopark, three of which are under construction in this country. The principle on which this system works is that of a multi-storey building, divided into berths served by mechanically propelled trolleys. The cycle involves the stopping, by the car owner, on a grid, where he can lock the car and leave it. A dolly is slid under the wheels, a button pressed, and the car is lifted on to the elevator. At the selected floor, the elevator stops and a trolley takes over. The dolly parks the car in the chosen berth. The trolley is then free to collect any car required for discharge or to return to the reception bay empty. A full cycle is estimated to take 60 seconds, when one lift is available for 60 berths.

Auxiliary power is provided by batteries to ensure sixteen hours operation in case of mains supply failure, and trolleys carry their own source of power in self-charging batteries. Should all else fail, an occurrence most unlikely in Great Britain, the whole cycle can be carried out manually.

The ground area required per berth is 200 sq. ft. and the cost is between £425 and £450 per car space. For industrial use where external appearance is not so important, construction costs can be as low as £325 per berth.

Reader information reference No. 15.

Pearce Autopark

The Pearce Autopark in Birmingham has been in operation for four years and is proven in its commercial potential as it has operated profitably since it was opened.

Electrically operated lifts serve all five floors, but the final parking of the cars is carried out by hand. The cars are pushed from the lifts on to a trolley which runs on rails between the rows of cars. One man and a boy are required to handle a loaded trolley. The final stage of parking is the pushing of the car into the space selected, but even with this amount of manual operation, the intake and discharge rate of 100 cars per hour is claimed.

The K.F. parking system in operation.

The cost of constructing the Pearce Autopark was £230 per car space, exclusive of land, on a site area of 7,200 sq. ft. It comprises 210 car spaces. Parking charges are 2s.-4s. for three hours, depending on the size of the car, and 4s.-6s. per day.

Reader information reference No. 16.

The K. F. System

One simple system so far little known is the K. F. (Kingsbury Fitch) parking rack layout which is particularly suitable for the conversion of existing space to take more cars, but it should also find many users who are starting from scratch.

The K. F. Carpark is of unit design, each unit taking up to eight cars. Two concrete uprights are set into the floor to support prestressed concrete cantilevers. Concrete is then laid across the cantilevers to form solid racks on which the cars can be stored. A fork-lift truck with specially designed forks lifts the cars into the space selected. The speed at which cars can be parked or delivered varies according to the number of trucks in use, but a ratio of one truck to 60 car spaces can complete a full cycle in 60—70 seconds. If starting with a nearly empty garage, acceptances can be made at the rate of four per minute. Cost per car space is approximately £200 excluding land.

The advantages of the K. F. system appear to be its simplicity, cheapness and adaptability. The units can be laid out to suit any site shape and can be rearranged to fit any subsequent alterations to the site.

Reader information reference No. 17.

Zidpark

Zidpark is a mechanical parking system of Swiss design as yet not in actual use in this country. However, a six-storey building is under construction in Upper Thames Street, London, which will incorporate the Zidpark system, and which is expected to be in operation by the end of the year.

Zidpark is a multi-storey unit design, a central elevator serving four cars only on any floor. The economical number of floors is stated to be ten, or one lift to forty cars. Any number of these forty-car units may be put together, forming a complete garage of the desired size, and shaped to fit almost any site.

An unusual feature of the operating of this system is the lateral movement employed in the actual parking of the cars, in preference to the more commonly used forwards and backwards movement. From the time a car is placed on the reception conveyor, locked and with brakes on, the only movements are sideways. Conveyor belts, fully automatically controlled from a ground floor panel, put the car on the elevator platform, park it and de-park it when required.

Emergency power supplies can be incorporated and each lift is wired with split circuits, giving maximum reliability in operation. Intake and discharge rate is from 40 seconds to 70 seconds per car.

The cost of Zidpark naturally varies enormously with the way it is installed, either by incorporation into existing buildings or special construction. In Upper Thames Street, there will be space for 464 cars at a cost of £650 each, exclusive of land.

Reader information reference No. 18.

At Westminster

ROAD SAFETY DEBATES

THE Easter road casualties, which high-lighted the growing danger of the roads that accompanies increased motorization, gave a more than usual sense of urgency to the recent debates on road safety in both Houses of Parliament. The Road Safety Bill, introduced by Mr. Graham Page, provided the occasion in the House of Commons, and a Motion by Lord Elton in the House of Lords.

The main proposals of Mr. Page's Bill were tests for alcoholic content, more severe penalties for motoring offences, and the creation of a number of new ones aimed at reducing accidents, and the establishment of a national road safety enforcement corps separate from the police. In the event, the Bill was talked out having been opposed on grounds, among others, of the difficulty of enforcement, that the case and practicability of tests for alcohol were as yet unproven, and that there was a preference for traffic wardens to a new police force.

Both debates, however, enabled Members to throw out a number of suggestions for improving road safety. These varied from stricter enforcement and severer penalties to a universal speed limit, from more extensive education and propaganda to the staggering of holidays, from pedestrian segregation to the banning of dogs from the roads, from the elimination of black spots to the building of more and better roads, and the wider application of the methods and techniques of traffic engineering.

Government spokesmen in both Houses accepted the wisdom of much of the advice tendered but gave little indication of any new or specific measures contemplated. They probably succeeded, however, in what appeared to be their aim: to get the problem into its correct perspective without seeming to be complacent. The Minister of Transport, for instance, pointed out that the road deaths for England and Wales over the Easter holidays averaged 17.4 per day, compared with 17.9 for Great Britain during the whole of 1959, and rejected the Opposition claim that this was a 'national disaster' any more now than previously. Mr. Marples also alleged that because responsibility was shared between Government, local authorities and the individual, there was a limit as to what could be done. He also shared the view of many speakers in both debates that human behaviour, carelessness and frailty were the main causes of road accidents, to which drink and vehicle defects contributed.

Influence of Road Conditions

During the Commons debate, the Minister and a former Parliamentary Secretary, Sir Richard Nugent, were among the few who gave due weight to the influence of road conditions and engineering on road safety. In this context the Minister stated:

> 'On the engineering side there is no doubt that new roads and the improvement of old ones make a great deal of difference.'

He also instanced the cut in accidents of one-third on the M1 and A5 in comparison with the previous record on A5. He referred to the work on materials undertaken by the Road Research Laboratory, to the removal of black spots and the employment of double white lines as steps taken to reduce causes of accidents.

It fell however to Sir Richard Nugent to make the case for traffic engineering. After stating that reduction of accidents could best be achieved by road building, and pleading for pressing on with the road programme, he said the next greatest contribution was the elimination of traffic conflicts by the scientific design of traffic movement by the introduction of the traffic engineer into the handling of road and traffic problems. In his view, this would lead to the working out of better patterns of traffic movement, by removing, for instance, conflicts between vehicles and pedestrians, by eliminating right hand turns and the like. He added:

> 'Those of us who have visited American cities, and seen the results of applying traffic engineering effectively during the past ten or twenty years, will have been enormously impressed by the progressive reduction in the number of accidents, as the methods of the traffic engineer have been progressively improved.'

Support for Traffic Engineers

The importance of road design and conditions was stressed by more speakers in the Lords than Commons, but greatest support for traffic engineering came from Lord Bossom. He stated that in his opinion unsatisfactory roads were much more important and costly than was generally believed. He instanced many ways in which minor improvements and imaginative planning could bring about improvement, and without which, he maintained, complete traffic stagnation would result. He added:

> 'Obviously, the correction of all bad corners should occupy an exceedingly high priority in all road-improvement programmes. Flyovers, double-decked roads and pedestrian bridges will all come to many of our cities sooner or later, and we should plan all present improvements to avoid making it more difficult or costly when these are installed in the years to come.'

Of the traffic engineer Lord Bossom said:

> 'In some countries traffic engineers are retained in the same way that we require every local authority to have a public health inspector. Many big cities in America—in fact nearly all of them—must have a traffic engineer. He is an expert, and he saves time, money and accidents, and no doubt we could do a lot by having such officers here. I have seen it quoted, I think (although I am not sure of this figure), that we have only 56 traffic engineers in Great Britain. Realize what we could do if we multiplied that figure four or five times, so that every big city had a traffic engineer! Where they are employed the results are most significant.'

He was supported by Lord Brentford who said:

> 'But I am sure that all these things have to be investigated separately. The cause of each separate type of accident has to be ascertained, and then that cause can be tackled and a solution can be found which will eliminate it. It is a question of research and, as my noble friend Lord Bossom in his admirable maiden speech indicated, it is a question that requires the attention of a great deal more traffic engineering in this country. We hardly know anything about it. Until we expend considerable sums in the universities upon fundamental research in traffic engineering as well as in the training of traffic engineers, so that we have a steady flow of really high-powered traffic engineers in all our local authorities, we shall not know whether the solution which we are applying is a correct one or not.'

The Parliamentary Secretary, Lord Chesham, in winding-up the debate supported them both and referred to traffic engineering in these words:

> 'Both noble Lords were quite right: traffic engineering is young in this country; there is a shortage of trained men, and we have to get to work as soon and as fast as we can. There are, fortunately, encouraging signs, such as the creation of a Chair of Traffic Engineering at the University of Birmingham. But I refer also to highway engineering, and I include the responsibility, which is shared, as we know, by the Government and local authorities, for providing new and improved roads. That, of course, includes the replacement, as it is possible, of the three-lane highways.'

It was left to Lord Bathurst, who also spoke for the Government, to give the priorities on which the present roads programme is based. He said that the firm priorities which had been fixed and adopted for assessing road schemes and for deciding the order in which they should be carried out were:

> 'The contribution a road makes to the national network which is being created; the industrial load it carries; and—by no means least—its accident record and the elimination of accident black spots. Those are the criteria by which priority is given to all major schemes all over the country.'

P.C.

WHY VOL. 2?

The fact that our first issue was numbered VOL. 2, No. 1, has mystified a number of readers. The explanation is purely technical. Once the name for the journal had been decided it was obviously wise to protect it and this required filing a skeleton issue with certain designated libraries. It was not otherwise circulated but it had to be Vol. 1, No. 1.

RECENT MINISTRY GRANTS

The Ministry of Transport has made a number of grants in the last few weeks towards the improvement or construction of roads, both in the northern and southern parts of Britain. A brief description of five of these grants is given here.

TEMPLE MILLS BRIDGE, HACKNEY

£146,205 has been granted to the London County Council to assist in the reconstruction of the Temple Mills Bridge at Hackney in London. This bridge carries the A106 over the River Lea. It was damaged by floods in 1953 and only temporarily repaired, but the new bridge will have two 30 ft. carriageways and two 12 ft. 6 in. footways. The approaches are also to be improved to provide two carriageways for a distance of 150 yards and Temple Mills Road and Homerton Road will be realigned.

VAUXHALL BRIDGE

Another Ministry grant has been made to the London County Council, this one towards the cost of carrying out improvements to the crossroads at the northern end of Vauxhall Bridge. This intersection is used by more than 35,000 vehicles per day, and at peak hours it is very congested. Each leg of the crossroads is to have three traffic lanes and central guide islands, giving a width of about 30 ft. through the signals. A new link road will be made through Bessborough Gardens to simplify the operation of the traffic lights. New signals are to be installed at the junction of John Islip Street and Vauxhall Bridge Road, to co-ordinate the two intersections and increase their capacity. The work will be carried out by contract and will cost £141,000.

WANDSWORTH ROAD, LAMBETH

Nearly half a mile of the Wandsworth Road in Lambeth is to be reconstructed to take a four lane carriageway in place of the present one, which is as narrow as 24 ft. in some places, and a grant of £166,125 has been made to the London County Council towards these works. Work on this scheme is expected to begin later this year and will take some twelve months to complete.

SOUTHAMPTON

Traffic congestion at Seven Dials junction in Southampton will be reduced by the introduction of a one-way circulatory traffic system in place of the existing roundabout. Towards the cost of this, the Ministry of Transport has made a grant of £282,786 to the Southampton County Borough Council. To replace the existing roundabout would cost so much that it has been decided to improve the roads and incorporate them in a one-way traffic system. The opportunity is also being taken to realign and improve several of the approach roads and the first part of a new Docks Road will be built to supersede St. Mary's Street as a through traffic route. It will have dual carriageways and a pedestrian link between shopping and residential areas on either side.

NOTTINGHAM

The old railway bridge, which has long been a cause of very serious traffic congestion in London Road, Nottingham, is to be modernized, and a grant of £190,000 towards the total cost of about £254,000 has been made. This bridge, which carries the A612 over the Midland Region railway lines, is no longer adequate for present-day traffic and is to be widened to take a 48 ft. carriageway in place of the 27 ft. one it accommodates now. At the same time, one span of the bridge is to be reconstructed. Work on this project is expected to start in September and will be carried out partly by contract and partly by direct labour, to the plan prepared by the City Engineer and Surveyor.

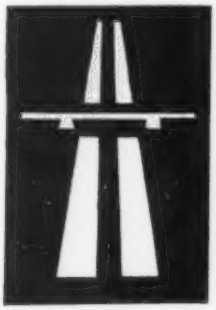
ROTHERHAM-BY-PASS

Sheffield County Borough Council are to receive a grant to assist in the construction of the first two miles of the proposed Rotherham By-Pass. Designed to reduce the congestion in the centre of Sheffield, this first section will extend from Handsworth Road (A57) westwards to a junction with Manor Lane. It will also serve the proposed new Wholesale Market, which will be sited on the north-east side of the by-pass. Only one 24 ft. carriageway will be built at this stage, but the overall width of 52 ft. allows for a second carriageway to be constructed at a later date. It is planned to extend the new road westwards for about another mile to Commercial Street (A616) and a fly-over will be built at Sheaf Street (A61). The existing roundabout at the Prince of Wales junction will be replaced by a fly-over and the whole length of the road will have dual carriageways. This second stage of the By-Pass will cost over £1 million.

ROAD SIGNS FOR MOTORWAYS

The signs shown below, which were based on proposals made by the OTA/PIARC Sub-Committee of Experts, were recently approved by the Economic Commission for Europe.

1. (*above*) *Start of motorway with single carriageway.*



2. (*above*) *Start of motorway with dual carriageway.*

3. (*below*) *End of single carriageway motorway.*

4. (*below*) *End of dual carriageway motorway.*

COURSES IN TRAFFIC ENGINEERING

IN view of the current interest in the technical facilities available for training in traffic engineering methods and techniques it is proposed to publish each month notes on the courses available at those few universities where they are available.

University of Birmingham

The first Chair in Highway and Traffic Engineering in this country was created at the University of Birmingham last year and Dr. J. Kolbuszewski appointed to it. The Graduate School in Highway and Traffic Engineering is part of the Department of Civil Engineering. The course nominally lasts for one year, only nine months are spent in fulltime attendance at the University for lectures and laboratory work. The last three months are spent in practical training in industry arranged by the Graduate School, during which time the student completes his critical reports on the laboratory work and research project that he carried out earlier. Although this is designed to keep a student's secondment from his post as short as possible, it is regarded as the shortest practicable course of study to be of permanent value. Students attend at the University from early October until early July. They are examined in June, and submit at the end of July their reports on coursework projects. Reports on the three months practical training have to be submitted at the end of September. Candidates are required to attain the required pass standards in both written examination and their reports and qualify for the M.Sc. degree.

In the syllabus the lecture course on Traffic Engineering is described as follows:—

> General characteristics of the road user, the vehicle, the system and the traffic. Road users' behaviour. Traffic censi, methods of analysis of origin and destination, capacities and movement on rural and urban routes, study of the intersection. Statistical methods. The problem of urban parking. Records, analysis and causes of accidents. Traffic regulations. Traffic lights, signs, street lighting and fog. Traffic trends and design factors for urban and rural areas including geometric layouts, one-way street systems, horizontal and vertical alignment, sight distances, cross section and intersections. Special problems of urban and rural motorways. Influence of surfacing. Street and off-street parking facilities and road amenities. Rural and urban landscaping.

Work Undertaken

1. Urban and rural traffic studies including origin and destination, volumes, spot speeds and headways.
2. Intersection characteristics and geometric design layout.
3. The movement of pedestrians including flows and habits in city centre areas and the relationship between the type of shops and frontage length in the generation of pedestrian traffic. Travel habits of office workers in large office blocks.
4. The investigation of road haulage operations with special reference to the diversion and generation of industrial traffic to new motorways.
5. Studies of responses and reactions of road users to external stimuli in the determination of physiological and psychological factors in vehicle operation and its effects on road design layout.
6. The applications of photogrammetric techniques to aesthetic aspects of route location.
7. Model tests of road culverts to determine the effect on their discharge capacity of various inlet and outlet conditions.
8. Model tests of road gully inlets and effects of channel gradient, cross-fall and inlet dimensions on capacity.
9. Tests on the consumption of fuel by vehicles in varying traffic conditions related to geometric layout and road conditions.

Work Planned

The above programme will continue as long-term studies in these fields.

In addition, work in the following fields will also be initiated:

1. Studies of parking characteristics both kerb and off-street in relation to overall planning requirements and design layout.
2. An extension of Item Nos. 5 and 9 to include field work studies of both vehicle and driver characteristics.
3. A study of road accidents.
4. Effects of regulation on the control of traffic.
5. The design and use of a large scale model for the study of major road alignments.
6. Time and motion studies of the operation of Civil Engineering plant on highway work.

DIPLOMA EXAMINATION

THE first examination for the Diploma in Traffic Engineering conducted by the Institution of Highway Engineers was held in April and 16 students sat for it. Papers were set in four subjects: Traffic Investigation, Design for Traffic, Planning for Traffic and Traffic Law. For three of the papers students were required to answer four questions out of six and for the one on Traffic Law six out of eight, within the three hours allowed for each paper. To illustrate the scope of the examination the following questions, two from each paper are reprinted.

Traffic Investigation

It is proposed that kerb parking in a business and shopping district should be regulated by parking meters and that long-term parking of more than two hours duration should be accommodated in a garage. There would be a single standard meter charge for all periods up to two hours. How would you conduct a survey and analyse the data to determine:—

(1) the total revenue to be expected from the parking meters;

(2) the average proportion of spaces that would be occupied at any one time?

List four methods of conducting an origin and destination survey. Describe two methods in detail, mentioning the advantages and disadvantages of each and describing each step from planning to final analysis.

Design for Traffic

Describe the chief features of the 'double white line' system of carriageway markings as used in this country. What criteria govern their use and how are these related in practice to conditions on a given road?

Describe one method of surveying a road preparatory to the introduction of double white line marking.

How is the traffic capacity of a roundabout affected by such design features as the length and width of the weaving sections, the entry width, and by the distribution and character of the traffic in the weaving sections? Refer to any experimental evidence you know of in support.

A trunk road carrying 10,000 vehicles per day comprising dual 24-ft carriageways separated by a 15-ft central reserve is intersected at right-angles by a country road carrying 4,000 vehicles per day comprising a single 30-ft. carriageway. Assuming 1,000 per day on each approach road turn left and an equal number turn right, illustrate by means of a dimensioned sketch a suitable form of roundabout. Indicate on the sketch appropriate column positions for overhead lighting and state what mounting height and type of lantern you would employ.

Planning for Traffic

An outline development plan to a scale of 6 inches to 1 mile has been prepared for a New Town with an ultimate population of 80,000 persons in 20 years' time. The plan shows the location and size of residential areas, industrial zones, neighbourhood shopping, together with a main shopping, business and civic centre, linked by a road network designed according to the principles of precinct planning.

What preliminary estimates of traffic flow should be made in order to test the adequacy of the planners' road system and what assumptions would need to be made regarding ownership and use of vehicles by the New Town population in order to do this?

Illustrate, with dimensioned sketches typical designs for the siting and layout of buildings in relation to the principal shopping streets, main traffic routes, neighbourhood development roads and their intersections and interchanges.

Give a brief account of the problem of forecasting future traffic flows in Great Britain, with particular reference to the construction of motorways. Comment on the use of the average daily flow in 1954 as a basis of calculation and distinguish between urban and rural areas when discussing the factors which affect traffic increase.

(*Concluded on page* 117)

NEW PUBLICATIONS

International Driving Manual. World Touring & Automobile Organization. 5s.

An International Driving Manual has been published by the World Touring and Automobile Association, having been prepared at the request of the Economic Commission for Europe of the United Nations. Its purpose is to extend knowledge of basic principles which apply to driving, to assist in the improvement of drivers' behaviour and to encourage greater uniformity. As such, it should succeed, provided it is well circulated and studied, but most countries with a high degree of motorization already have their own driving codes and with these the Manual may conflict in some particulars. Any move, however, towards standardization of, for instance, signals given by drivers, is to be welcomed. Some of the advice given is wise, but much that is recommended is common sense and may appear to be fairly obvious but it is nonetheless valuable since many a motorist becomes an anarchist when seated behind the driving wheel, and many an accident would be avoided if he paid greater attention to the behaviour of other road users. The Manual covers most conditions in which the average driver will find himself, as well as the basic manoeuvres and techniques of driving, and concludes with some useful tables on advisable speeds in given conditions as well as stopping distances at different speeds. Its final advice to the motorist is 'Remember the Golden Sequence: Mirror, Signal, Manoeuvre'.

Road Note No. 27. Department of Scientific and Industrial Research. H.M.S.O. 1s. 9d.

This note describes the operations of an apparatus developed at the Road Research Laboratory to provide highway engineers with a routine method of checking the resistance of wet road surfaces to skidding. The apparatus embodies a pendulum which sweeps a rubber slide over the road surface and with its aid the frictional resistance between slide and the surface can be determined. The characteristics of the apparatus have been chosen to simulate the conditions of sliding between vehicle tyre and road, and adjustments are provided so that tests can be carried out on gradients and on rough and heavily cambered roads. The Road Note describes the method of operation of the tester, its use on wet road surfaces, and the interpretation of the results.

Manual of Uniform Traffic Control Devices for Canada

New standards for traffic control devices, which are now being adopted in Canada, are contained in a Manual of Uniform Traffic Control Devices published and distributed by the Canadian Good Roads Association. These are recommendations for standards to be adopted by the ten provinces and the numerous municipal governments in the country.

Historically and traditionally, Canada occupies a place somewhere between the United States of America and Europe, and in their road signing Canada has taken up a place somewhere between the symbolized systems of Europe and the largely legendary signs of the U.S.A. In developing the Canadian standards, the various subgroups of the Joint Committee on Uniform Traffic Control Devices have studied signing, signalization and marking systems in other countries. European standards were examined, but in Canada any substantial deviation from the American standards would create a hazard, because of the large numbers of American motorists and truckers who travel on the Canadian roads. There is therefore no drastic departure from the American system in the new standards, but there are a number of new signs that use symbols for their communication, an innovation that has created considerable interest in the United States.

There are three main sections in the Manual of Uniform Traffic Control Devices: signs, signals and markings. There are also recommendations for the application of paint and other materials to road surfaces and hazards, to assist the motorist. The Manual of Uniform Traffic Control Devices is published in loose leaf form, which will allow for revisions to be incorporated from time to time.

Guidance Notes for Purchasers of Street Lighting Lanterns. Electric Light Fittings Association. 2s.

These Guidance Notes for purchasers of street lighting lanterns are based on a questionnaire sent to members of the Association of Public Lighting Engineers, in association with whom the notes are published, following joint discussions between the two bodies. The purpose of the Notes is to assist purchasers to assess the quality of a lantern, but it is pointed out that they constitute neither a British Standard nor a minimum quality specification, nor even a guide to the technique of street lighting. Nonetheless, they contain helpful advice on such matters as design and construction, the choice of materials and maintenance, together with a list of British Standards.

Courses in Traffic Engineering

(*Concluded from page* 116).

Traffic Law

Describe the various ways in which the use of the carriageway by stationary vehicles can be controlled, indicating in each case the legal powers available. Explain how the use of the carriageway for parking purposes can be legalised, and how a local highway authority can make a charge for its use in this manner.

Describe the legal powers available for the provision of uncontrolled and signal controlled pedestrian crossing places. Explain the procedure to be adopted before such places can be established, and the salient features of authorized crossings of each type.

Fifth International Traffic Study Week

The Fifth International Study Week, organized by the joint committee of the World Touring and Automobile Organization, the Permanent International Association of Road Congresses (PIARC) and International Road Federation, is to be held in Nice, from September 26 to October 1.

Seven main topics have been chosen for discussion; and experts from all over Europe will lead these discussions or lecture on the subjects put up for discussion. Details are as follows:

Theme I: Traffic and Parking Needs Generated by Building Development.

Chairman: Mr. J. F. A. Baker, Chief Engineer (Highways), Great Britain. *General Reporter:* Mr. Erik Hasselquist, Chief Engineer, Royal Board of Roads and Waterways, Sweden.

Theme II: The Problem of Capacity in Road Planning.

Chairman: Mr. H. Hondermarcq, Director General of Roads, Belgium. *Lecturer:* Prof. Dr. M-E. Feuchtinger, Consulting Traffic Engineer, Federal Republic of Germany. *Panel Members:* Prof. P. H. Bendsten, Technical University of Denmark; Mr. J. T. Duff, Ministry of Transport, Great Britain; Mr. J. Elkouby, Roads and Bridges Engineer, France; Mr. M. Jenni, Traffic Engineer, Zurich, Switzerland; Mr. P. Lefèvre, Chief Engineer, Belgium.

Theme III: Economic Losses due to Traffic Congestion.

Chairman: Mr. Eric Legrand, President of the Royal Touring Club of Belgium. *General Reporter:* Mr. R. Coquand, Director of Roads, France.

Theme IV: Individual and Mass Transport in Urban Areas.

Chairman: Mr. A. Rumpler, President of PIARC, *General Reporter:* Sir William H. Glanville, Director of Road Research Laboratory, Great Britain.

Theme V: Visual Aids to Driving on Urban and Rural Roads.

Chairman: To be announced. *Lecturers:* Mr. Granville Berry, City Engineer and Surveyor, Coventry, Great Britain; Mr. H. Lorenz, Chief Engineer, Nuremberg, Federal Republic of Germany; Ir. A. E. J. Nap, Chief Engineer-Director, Rijkswaterstaat, Netherlands.

Theme VI: The Influence of Speed and Speed Regulations on Traffic Flow and Accidents.

Chairman: Prince Caracciolo di Castagneto, President of the Automobile Club of Italy. *General Reporter:* Dr. R. J. Smeed, Deputy Director, Road Research Laboratory, Gt. Britain.

Theme VII: Problems of Intersection Design.

Chairman: Mr. J. L. Escario, Director, Transport Laboratory, Spain. *Lecturers:* Mr. P. Borel, Advisory Bureau for the Prevention of Road Accidents, Berne, Switzerland; Mr. E. Goelen, Roads and Bridges Engineer, Belgium; Ir. F. H. van der Linde van Sprankhuizen, Chief Engineer, Utrecht, Netherlands. *Discussion opener:* Ir. C. A. Kuysten, Koninklijke Nederlandsche Toeristenbond, ANWB, Netherlands.

Following the International Traffic Study Week, the International Road Safety Congress will be held. Details will be published next month.

ROAD PLANT and EQUIPMENT

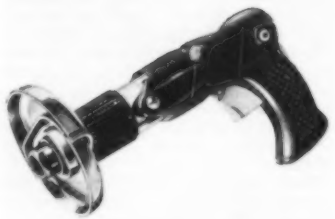
THE chairman of the Federation of Civil Engineering Contractors, Mr. J. M. Laing, stated at a recent press conference that the resources of the British road-making industry would not be strained if the building programme were to be increased by more than double. He said that the industry had this enormous unused capacity because firms had organized themselves to cope with a road-making programme which had fallen far short of fulfilling its expectations. These firms were now in a position to undertake work to the extent of £73 million more than the present expenditure of only £70. The Ministry of Transport had had its attention drawn to this wastage of constructional capacity and also to the possible savings to the country which might be made by enlarging the road-building programme, but so far there had been no positive response. As he said, 'There does not seem to be any over-all, long term plan'.

Piccadilly-Knightsbridge Underpass

On work on the construction of the Piccadilly-Knightsbridge Underpass and the Marble Arch Improvement Scheme, the Cubitts-Fitzpatrick-Shand consortium are to employ the largest assembly of plant and equipment used in London on a road building scheme. It is valued at some £1¼ million. Among new techniques never before used in this country is the Italian ICOS-Veder process, for supporting the sides of excavations; and prefabrication will be used in most of the fifteen pedestrian subways to save up to four weeks on the site.

Before the trench for the underpass is cut, reinforced concrete retaining walls will be built by the Italian ICOS-Veder process. Four special grabs will be brought from Italy for this work, which involves the cutting of a twenty inch trench to the depth of the retaining wall. The sides of the trench will be stabilized with a specially prepared Bentonite suspension. The reinforcement and concrete are placed in the same way as for underwater construction, and the Bentonite, displaced by the concrete, flows into adjoining sections of the trench where it can be re-used. Excavation of the underpass follows the completion of the retaining walls.

Other plant and equipment which will be used on the work include the latest type of Swedish Feimart 1500 turbo mixer, four-ton Blaw Knox high discharge truck mixers, one 30RB crane and grab, a 605 NCK crane and grab with a 70 ft. jib and two mobile Neal cranes. Two Traxcavators and six small excavators will be employed as well as a substantial fleet of dumpers.



The 'Rapid Minor' cartridge hammer.

Two New Tools

Explosive Power Tools Ltd., have recently introduced two new tools to their range, the 'Rapid Vibrodrill' and the 'Rapid Minor'. The 'Rapid Vibrodrill' is a dual purpose (rotary and percussion) portable electric hand drill and the 'Rapid Minor' is a cartridge operated hammer.

The Vibrodrill can be changed from rotary to percussion drilling by simply moving a knurled sleeve on the outer casing. The drilling speeds which the makers claim for this new tool are as follows: 1½ inches in flint aggregate concrete—15 seconds: 1½ inches in granite aggregate concrete—17 seconds. A particular feature of the 'Rapid Minor' is that of accuracy—it can only be operated at exact right angles to the material.

*For further details reference No.*19.

The 'Rapid Vibrodrill'

Three New Cats

The Caterpillar Tractor Co. Ltd. had three new products on show at the Mechanical Handling Exhibition—the D4C tractor, the 944A Traxcavator and the 995F Traxcavator. Many new features are incorporated in these machines and one of them is the side tipping bucket available on the 944A Traxcavator.

The 944A is produced in two versions, with either 2-wheel or 4-wheel drive and either petrol or diesel engines. Both the petrol and the diesel engines have a power output of 105 h.p. and the long wheelbase gives good stability. Consideration has been given to operating-cycle times and the reverse speeds are up to twenty five per cent faster than the forward ones.

For further details reference No. 20.

The Aveling—Barford Pneumatic tyred roller.

Pneumatic Tyred Roller

Aveling Barford Ltd. have announced that they are producing a completely new self-propelled, pneumatic tyred roller at their works at Grantham. This new roller, which is believed to be the first one made in this country, is not put forward as a substitute for the normal, steel-wheeled rollers but rather as an adjunct to them to secure the maximum density and durability in flexible pavements. The rear tyres on the new roller are set to span the gaps left by the front ones, so that complete coverage is achieved over the full rolling width.

For further details reference No. 21.

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The Planstore filing system

The Storage of Plans

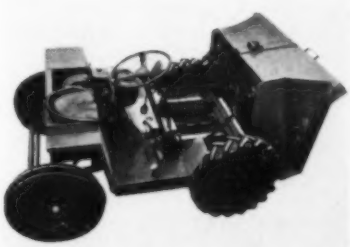
James H. Randall & Son Ltd. are the makers of a portable cabinet for the storage of building and site plans. They also make various sized cabinets (*as shown above*) for the storage of plans in larger quantity and over longer periods. The system is simple, but effective. A Planstore unit consists of a sheet metal body sub-divided honeycomb fashion into square section tubes which extend from the front of the body to the back. Drawings are rolled, together or singly, and one end of the roll is placed in a plastic cap which grips it firmly but flexibly. The other end is then pushed fully home into one of the compartments until the cap fits into the square tube, which provides a dustproof closure.

For further details reference No. 22.

Two New Dumpers

One of the first results of the merger of E. Boydell & Co. with Winget Ltd. has been the introduction of two new dumpers to the Winget range of contractors equipment. These have been named the 'Red Devils' and are designed to give the maximum tractive effort under the worst possible conditions. These machines, which have capacities of 15 and 22½ cwt., include several features of interest. The steering column assembly has been redesigned, the front of the chassis is doubled to give freedom from torsion and there are no driving belts or chains. One noteworthy feature is the crane-skip which is available as an optional extra on both models. This enables the dumper to fetch one loaded skip from the mixer while the other is being dealt with.

For further details reference No. 23.



Winget Muir-Hill 15 *cwt. Dumper model* 2-*S, one of the* '*Red-Devils*'.

Twin-Power 14 yd. Euclid Scraper

It is announced by Blackwood Hodge that after extensive testing, both on proving grounds and actual contractor operations, the Euclid Division of General Motors, U.S.A., is now on full production of a new twin-power scraper of 14 cu. yds. struck capacity and 20 yds. heaped. Designated the Model TS-14, this all-wheel drive scraper is powered by two GM 4-71 engines, each with a separate Allison Torqmatic Drive consisting of torque converter and 4 speed semi-automatic transmission. With converter lock-up in each Torqmatic Drive, fuel economy is achieved with efficient use of the 296 total engine horsepower on grades and long high speed hauls. Air assisted remote control and full power shift enables operator to change from one speed range to another by a simple flick of the wrist. Tyres are 24.00 x 25. Two hydraulic jacks provide full 90° steering. All scraper operations —bowl, apron and ejector—are hydraulically and independently controlled. The ejector is of the positive roll out type actuated by a hydraulic jack that is identical to the apron jack. Two inter-changeable bowl jacks are connected to the scraper bowl through heavy duty levers and linkage. Cutting edge consists of 4 sections that are identical and reversible—each section is adjustable to provide efficient loading in any material.

The new low 'easy load' bowl gives the model the ability to self-load and to work under the most adverse conditions, and all-wheel drive, as proved in the big 24 yd. Euclid 'Twin', makes this new scraper useful for small yardage jobs such as secondary road construction, soil conservation, stripping and industrial grading as well as for medium and big, high speed, high production earthmoving projects.

For further details reference No. 24.

*The Euclid TS-*14 *Scraper*

STREET FURNITURE

A New Parking Meter

A new twin-flag parking meter, known as the Type 2/2 Parkomatic, has been introduced by Parking Meters (Europe) Ltd. It is of a similar type to those already in use in London, but the Parkomatic is claimed to be the only meter of truly British design available at present.

A feature of this meter is its foolproof operation. The coin slot will accept one or two sixpences or one shilling. Insertion of one sixpence will buy one hour's legal parking time and also winds the meter to give two hours' excess time and about fifteen minutes penalty time. The meter dials, hands and violation flags are clearly visible from both sides through windows, each of which is made of ⅛ inch Perspex sealed into the housing with rubber cork gaskets. The flags are in different colours and the dials are also coloured, so that the pointer of the meter gives an indication of how much is left of either the legal or the excess time, and when the penalty flag appeared. A handle indicator flag appears if the meter is jammed or incorrectly operated. An oblong coin inspection window shows the last and previous coins deposited and operating instructions are clearly printed on the inside of the windows. The rustproof mechanism is a complete unit, easily removed for quick replacement or for servicing. The meter head is mounted on a standard steel tube (2⅜ inches in diameter) secured to its upright post by a special device.

For further details reference No. 25.

The Type 2/2 *Parkomatic Meter*

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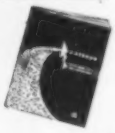

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